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APC vs TechLife

Why *APC*'s redesign is different to that of its sister magazine

Some *APC* readers have asked us why the recent design changes have been more conservative than the sweeping redesign and rethink of *PC User*, which is now known as *TechLife*. They're not complaining, just wondering. In particular, they've asked why *TechLife* has an augmented reality feature that embeds videos in the pages of the magazine, but *APC* doesn't.

The answer, in a nutshell, is *APC* didn't need to change dramatically. Its core audience consists of enthusiasts and techies, and their focus is very much on the nuts and bolts of core technology. The design of *APC* has been well-tested and only needed a freshening up. *TechLife*, on the other hand, is pitched at a wider audience. It has to make sense to general consumers as much as hardcore techies, so it has to strike a finer balance between consumer-friendly layout and design and the depth of content that attracts the tech-savvy – so a massive redesign was the only way to achieve this. Below we've set out the main differences between *APC* and *TechLife*.

Tony Sarno, Editor

SIZE

Both mags have gone up in size. Some readers asked why this was done, some saying *APC* no longer fits neatly on their shelves alongside the previous issues. The reason is simple: with a stronger focus on tutorials, the bigger size gives us more flexibility in presenting information. Check out the new series on building with Arduino on page 108. That works much better on a larger page.

AUDIENCE

APC's readers generally have some kind of strong connection with tech, either because they work in it or spend much of their professional lives with it. Not surprisingly, *APC*'s audience has the highest average income of any magazine at ACP Magazines. One advertiser described them as 'rich geeks'. *TechLife*'s audience is the tech-using consumer, so it's broader and larger. The effort goes into explaining how tech can benefit one's life, which *everyone* understands and appreciates.

WEB SITES

APC's **apcmag.com** is in the top 10 of all tech web sites in Australia. **techlife.net** has just launched, but is growing quickly. It has more updates than *APC* throughout the day because we cover more consumer-oriented products.

TOPICS

One myth we'd like to put to rest is that *APC* covers the PC, and *TechLife* the Post-PC era. They both cover the tech that impacts on us, from PCs and tablets to phones and the cloud – but they do it differently. *APC* assumes you want to know the technical details and even customise the tech; *TechLife* assumes you don't care about internals, you just want maximum usage from the product.

INTERACTIVITY

TechLife now has something called '*viewa*', which is similar to the 'AirLink' feature you may have noticed in some major metro newspapers. It allows you to point a smartphone at a page with the *viewa* symbol and see videos linked to the page. We won't roll this out to *APC* until *viewa* works consistently across all Android devices and OS versions. It's fine on iOS, but the developers are still trying to cover off the massively fragmented Android market.

IPAD EDITIONS

Both magazines are now available on iPad via Apple's App Store as interactive versions (both significantly cheaper than print at $5.49 because they don't have cover discs). Both will shortly be available as Android versions too.

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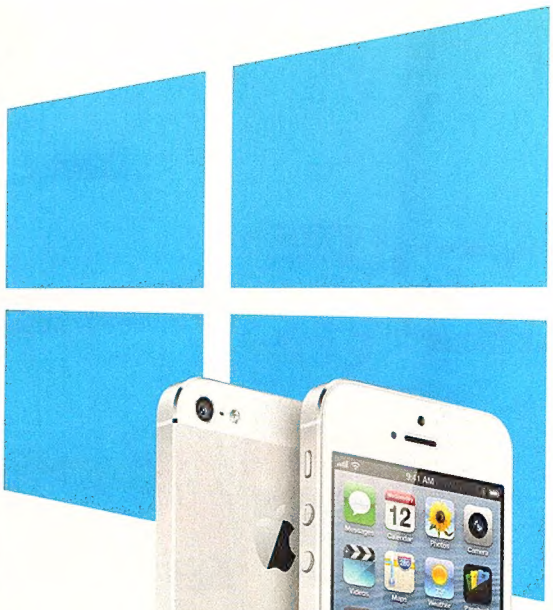

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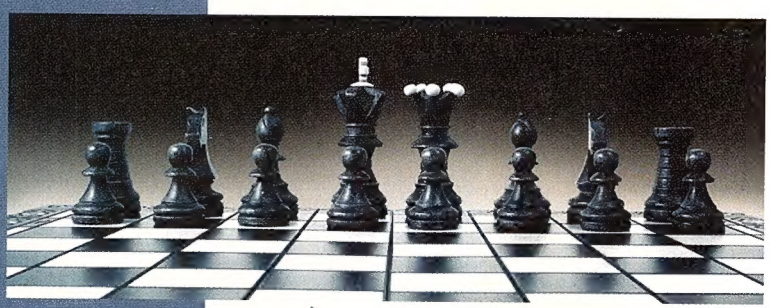

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Windows 8 UX Pack adds Windows 8 UI improvements to Windows 7.

WINDOWS TRANSFORMATION PACK 5

If you want to get the Windows 8 look in XP, Vista or Windows Server.

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06 editorial

TONY SARNO

The PC was losing its place as the primary computer...

The debate over Windows 8 and its touch-oriented interface takes me back to June this year when we launched *TechLife*, which was an evolution of *APC*'s more consumer-oriented sister mag, *PC User*. There was an outcry from long-term *PC User* readers so I wrote back to many to explain that the transformation of *PC User* had been necessitated by a changing market – the PC was rapidly losing its place as the primary computer in people's lives and the magazine needed to reflect that smartphones and tablets were increasingly taking over the central role in the consumer experience. I stressed that we had no choice but to revamp *PC User* if we wanted that magazine to prosper in the long term.

To illustrate my point, I used the example of Microsoft and Windows 8. I told many that the very champion of the PC, Microsoft, was changing its OS fundamentally because it too had worked out that unless it got onto the tablet and smartphone bandwagon, it might not be around in a few years. Drawing out the analogy as much as I could, I pointed out that just as Windows 8 and its interface were a dramatic departure from the PC-oriented UI of Windows 7 (to better work on touch-enabled devices) *TechLife*'s user interface was a dramatic departure from that of *PC User* (in order for us to better cover consumer technology).

Now I realise that Microsoft is a multi-billion dollar corporation that has helped shape the world we live in, and we're a pair of humble Aussie tech titles, but I definitely understand Microsoft's need to evolve as the market de-evolves from the PC to mobile devices. Nonetheless, success lies in the execution as much as the vision and I'm not sure that Microsoft has quite got it right.

For what it's really meant to be, a UI for tablets and hybrids, Windows 8's interface is brilliant. We've had a Win 8 Pro tablet for a while now and Metro just makes it so much more usable for doing real work than an iPad or an Android tablet – the UI seems a generation ahead of the other two, utterly intuitive when it's controlled by your fingers but also turning your tablet into a laptop when you switch to the traditional desktop to run something like Excel. But if you're using it on a desktop PC, the Metro UI is a usability disaster. It's simply the wrong interface for a mouse and keyboard-based PC. Period.

Back to the analogy, I think we're managing the transition better than Microsoft. Although *TechLife* changed the 'user interface' or layout and design extensively, it's still as easy to navigate as the old *PC User* after some getting used to, and although we're catering for new tech we're still covering PCs extensively, with the same writers as the old *PC User*, from Darren Yates to Helen Bradley.

We're even getting emails from older *PC User* readers who say they overreacted when the changes were made. But I'm not sure anyone's going to be writing to Microsoft saying they overreacted to the Metro interface when Windows 8 launches. That will happen only when Microsoft gives you the ability to switch it off when you're using Windows on a desktop.

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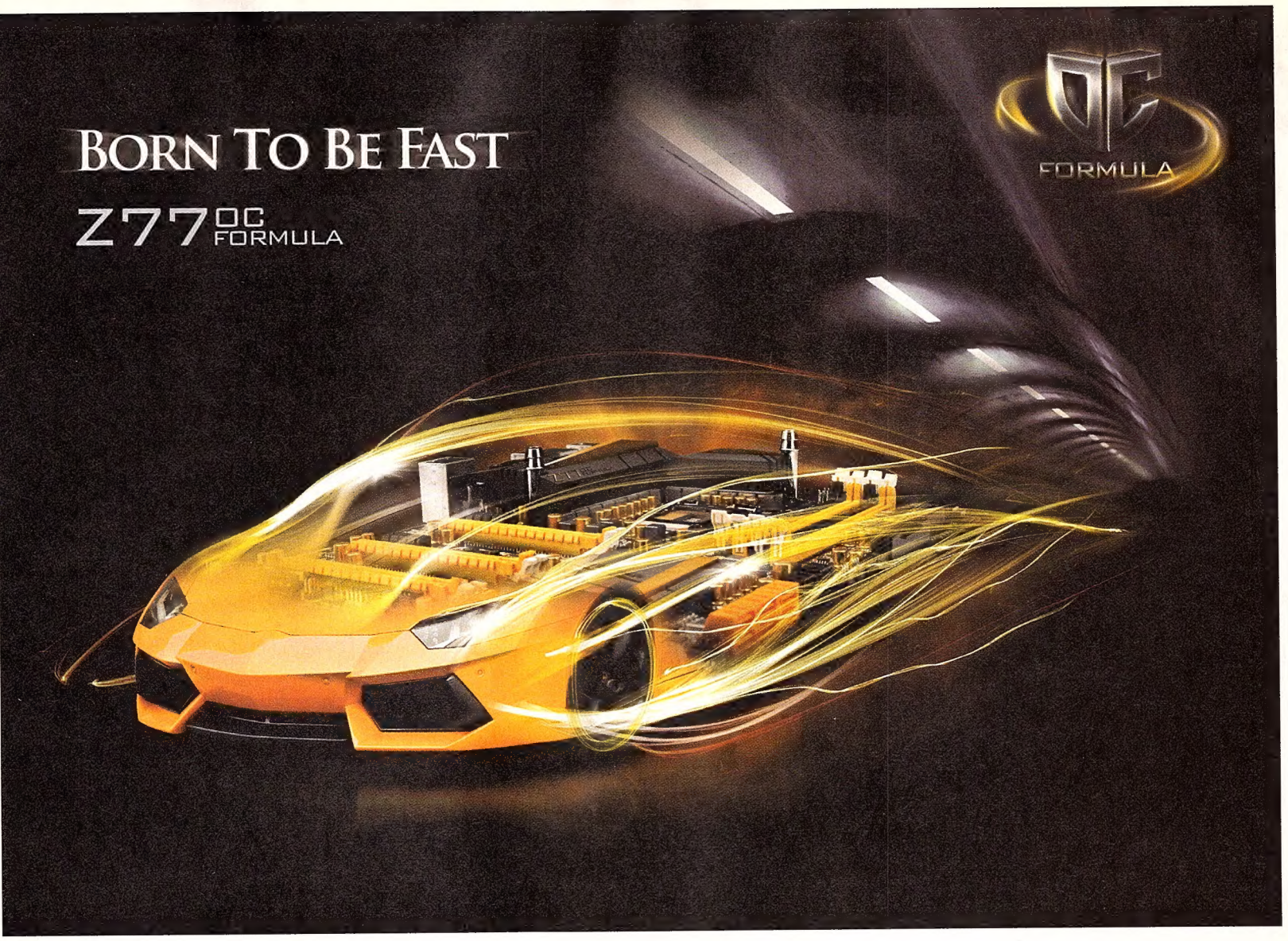

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TOP 6 REASONS PC GAMES ARE BACK

Reports of PC gaming's demise have been greatly exaggerated. In fact, it's come storming back. Here's why.

Despite the popularity of consoles and the growth of mobile gaming, PC gaming isn't going away. In fact, according to EA, it's the fastest growing platform for video games today. A report produced by interactive entertainment market research firm DFC Intelligence for Nvidia shows that back in 2010, the PC as a revenue generator from games was significantly smaller than consoles. Last year it largely closed that gap. This year it's predicted to be slightly bigger.

In the next five years, mobile gaming is also expected to grow, but only until it's about one-third the size of console or PC gaming. Meanwhile, PC game revenues are likely to become almost exclusively earned online, with a mix of subscriptions and digital downloads.

Here are the reasons PC gaming is back.

ONLINE GAMING

Online gaming is a major trend across all platforms, but it's something PC gamers are much more likely to be doing than console gamers. Due to its flexible and fast-changing nature, PC gaming was better positioned to cash in on the shift to online. According to DFC Intelligence, in 2008 around 70% of PC gaming revenues were online, with the remainder coming from retail. Last year it was around 85%. That figure will breach the 90% barrier in the next few years and slowly climb to near 100%.

LAPTOPS WITH HIGH-PERFORMANCE GPUs

Struggling to make laptops more attractive in the face of the tablets onslaught, laptop makers are releasing more models with high-performance graphics for games.

FREE TO PLAY

Measured in hours played, four of the top 10 games are free to play. That's *League of Legends*, *Heroes of Newerth*, *MapleStory* and *World of Tanks*. According to Nvidia's content development guru, Phil Wright, free-to-play caught a lot of people off-guard. "Five years ago, most people in the games industry would have laughed at the prospect of a free-to-play triple-A title with cutting-edge graphics. But it's happening right now," he says. The flexibility and openness of the PC means the barriers to a rapid transition to free-to-play are few.

BETTER HARDWARE THAN CONSOLES

There's a growing hardware gap between consoles and PCs. A mid-range GPU like the new GTX 660 is 4.3 times faster than a GeForce 9800 board from 2008, and a 9800 is miles better than any of the current consoles, which are pegged around GeForce 7800 levels. Put simply, consoles now look pathetic compared to even a mediocre mid-range PC.

SAVVIER CONSUMERS

The recent rise of tablets and smartphones is making consumers much more tech savvy. Wright reckons that gadget owners who've had a great experience with Nvidia Tegra-powered ultramobile devices are more likely to demand good graphics from their PCs. Chuck things like UHD 4K screens into the mix, along with the increasing prevalence of CGI cinema blockbusters, and you have a buying public that's a little bit more discerning when it comes to graphical fidelity – and some of them will be won over by the PC's obvious technical supremacy.

NEXT CONSOLES WON'T PUSH BOUNDARIES

The next round of new consoles is probably only a year away, but there's reason to believe they won't push the technical boundaries as hard as the existing bunch did seven or so years ago.

Put it all together and the next five years look like a potential golden age for PC gaming. Predictions any further than that are a fool's errand.

TOP 10 VERSIONS OF WINDOWS YOU'VE NEVER USED

01 WINDOWS 7 STARTER
You'll know this one only if you've used a netbook.

02 WINDOWS VISTA STARTER
Sold only to piracy-infested markets such as Colombia, India and Thailand.

03 WINDOWS FUNDAMENTALS FOR LEGACY PCs
A low-end version of Windows XP for old hardware.

04 WINDOWS XP EMBEDDED
Meant for embedded systems linking into the XP infrastructure.

05 WINDOWS XP HOME EDITION N
Without Windows Media Player as default, following EU anti-competitive ruling.

06 WINDOWS XP TABLET PC EDITION
For laptops and touch or pen-sensitive screens, an eternity before tablets appeared.

07 WINDOWS HPC SERVER 2008
A Windows for super-computers, of all things.

08 WINDOWS 3.2
A special version released in simplified Chinese.

09 WINDOWS ME
A successor to Windows 98 meant for home PC users, which was a bust.

10 WINDOWS 1.01
The very first version of Windows, released on November 20, 1985.

SURFACE COMPLAINTS

There's lots of disquiet about Microsoft's hardware intentions.

When Microsoft revealed its all-new Surface tablet earlier this year, the most surprising revelation wasn't the tablet itself, but the fact that Microsoft is planning on manufacturing the 10in unit without partnering with an outside company.

Traditionally Microsoft would turn to its hardware partners, including Acer, ASUS, Lenovo and others to handle the manufacturing duties once it had drawn up the spec, but this time around Microsoft is taking the reins itself – and in doing so is going head to head with partners who'll be making their own tablets to compete with Surface. Awkward!

Not surprisingly, manufacturers aren't happy about being shut out of the Surface business, especially after they've driven Microsoft's software business for all these years. Acer PC president Campbell Kan was so annoyed that he asked aloud, "If Microsoft is going into the hardware business, what should we do? Should we still rely on Microsoft or should we find other alternatives?"

Presidents don't typically say things like that out loud and in the wake of Kan's words being printed, Acer chairman J.T. Wang went on the record to reassure the media that Acer had no plans to quit developing Windows-based PCs.

Long-time partner Lenovo plans to release its own Windows 8 tablets and has expressed frustration with Microsoft's foray into the hardware side of things. CEO Yang Yuanqing told reporters he's confident Lenovo will build better hardware than Microsoft, but in the next breath he noted that ideally, he'd like to see Microsoft stick to what it does best: software.

ONLIVE SHUTS

It always seemed a little too good to be true... and it was.

onLive

For a fixed subscription each month, gamers could connect to a 'cloud' of PC games via a box attached to their TV and stream what they wanted.

It seems that OnLive's founders didn't quite do their maths, though. Its intricate algorithm could run multiple games from a rack of servers, but the company severely underestimated the number of servers required. Recently, just 1,800 concurrent gamers have been making use of OnLive's 8,000 servers and the service has been losing a whopping $5 million a month just to keep things up and running.

The service has been declared bankrupt and effectively ceased to exist. More than 150 OnLive employees have lost their jobs. Venture capitalist Gary Lauder has bought the existing intellectual property and technology, but how OnLive will ever work in any guise remains to be seen. It certainly shook up the games industry and made people rethink the role of hardware. Gaikai, which offered similar games streaming minus the console, has recently been bought out by Sony for a whopping $300 million, so there's still some life and interest in the idea.

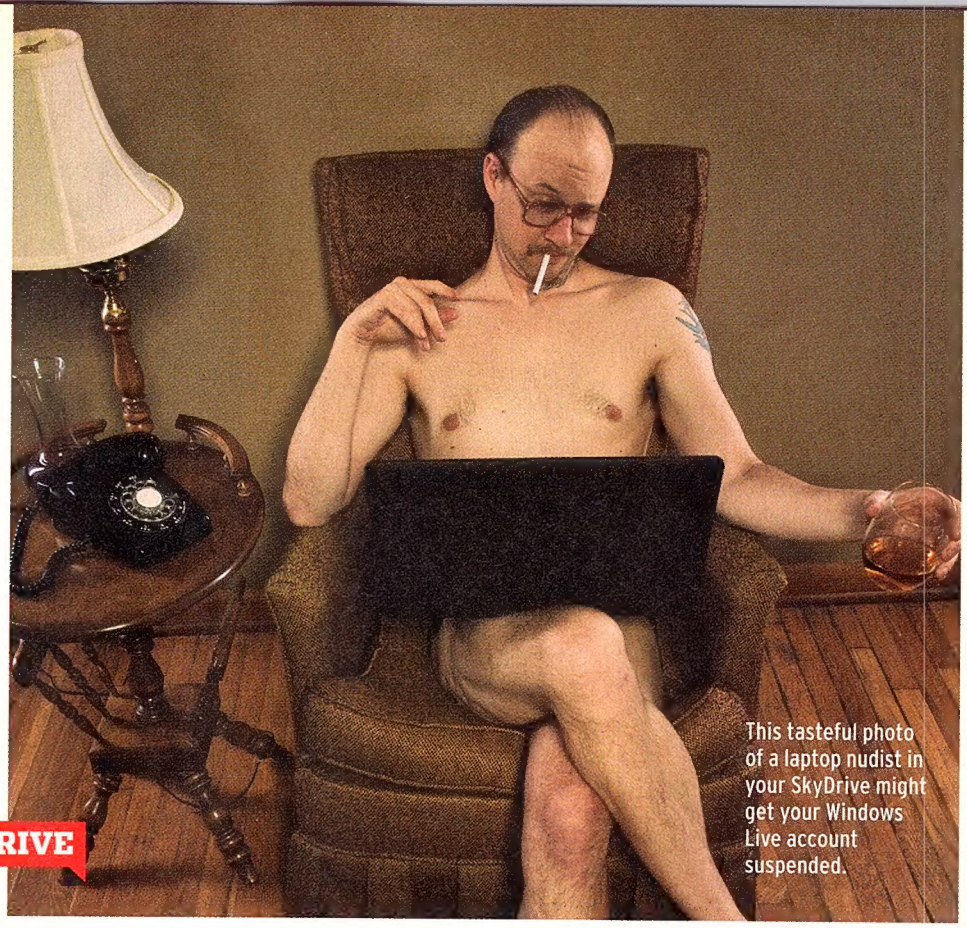
THE (A)PC REVOLUTION
NOV/1988

POWER LAPTOPS

With more power laptop announcements than any other time in PC history, October 1988 became the Month of the Laptop. Heading up the list was the market leader, Toshiba. It claims its $7,999 T1600 is the lightest 12MHz 80286-based laptop available. With two battery packs, it weighs just 5.2kg and each pack provides up to two hours of operation. With 1MB of RAM, a 1.44MB floppy and a 20MB hard disk, the T1600 features a backlit EGA screen that detaches so it can drive a standard EGA monitor.

LOTUS DELAYS AGAIN

The PC industry's most notorious item of vapourware – the legendary Lotus 1-2-3 Release 3.0 – moved yet another step away from reality recently, when Lotus officials announced that the long-awaited upgrade will be further delayed until the second quarter of 1989. In a half-hearted attempt to justify the delay, Lotus officials said that 1-2-3 Release 3.0 had been postponed in order to improve performance, fix bugs, perfect compatibility with other versions and shrink the code to reduce memory requirements.



This tasteful photo of a laptop nudist in your SkyDrive might get your Windows Live account suspended.

SKYDRIVE

MICROSOFT BANS NUDES FROM SKYDRIVE

Unlike Dropbox, Box and SugarSync, SkyDrive comes with porn police.

Microsoft has warned users that they shouldn't upload nude content to their SkyDrive folders because it contravenes the Windows Live Code of Conduct and they risk having their account suspended. And it's not just nude pictures that Microsoft bans, but *anything* it believes constitutes nudity, such as photos of partially nude people and even drawings of nudes.

Presumably Microsoft scans people's SkyDrives with software that identifies too much flesh in photographs – something like Paraben's Porn Detection Stick, software we tested at *APC* last year. Insert the Porn Detection USB stick into any computer and its software races through your drives and basically identifies any objects with more than the regulation amount of flesh. It then produces a list of likely offending pictures and allows you to scan the list and discard false positives.

So a Microsoft employee must do the same, since no software can identify what's porn and what's not 100% of the time, which means that he or she is also viewing whatever other photos are picked up by the Microsoft scanning software, to determine which ones are dodgy.

The key part of the Windows Live Code of Conduct, which governs SkyDrive, says users shouldn't upload anything to SkyDrive that: 'depicts nudity of any sort, including full or partial human nudity, or nudity in nonhuman forms such as cartoons, fantasy art or manga'.

It's not just porn that Microsoft dislikes. The terms and conditions, at **tinyurl.com/cu8f4l7**, also refer to other material considered undesirable, ranging from content that violates intellectual property laws to content that could be considered junk mail.

Can you afford to laugh this off? No, because if Microsoft finds manga nudes in your SkyDrive folders, it can suspend your Windows Live account and you'll lose access to other services or software connected to Microsoft's cloud.

The lesson here is that even though Microsoft integrates SkyDrive into Windows 8 and tries to convince you it's a drive on your desktop, it's not your drive, it's Microsoft's. Its contents are open to Microsoft's checks and you may have your access cut off if Microsoft doesn't like what you've put in there – as a German photographer found out last year when Microsoft cut off access to his Windows Live account when he placed some semi-nude photos in a SkyDrive folder.

If you do need to upload porn, try one of its competitors, such Dropbox, Box or SugarSync. Unless you're posting content that expressly breaks the law, you can upload what you like. APC

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Samsung NaviBot S

My mother used to say that sitting in front of a computer would make me lazy... wait until I tell her I've got a robotic vacuum cleaner! With its built-in camera and sensors, it maps your home and plans a cleaning path. If it comes across a big mess, it spends a little longer there. It can be programmed to clean when it suits you and when it's full, it will empty itself and recharge before continuing.

ONLINE www.samsung.com/au

Bose Solo TV Sound System

Hmm, I'm a little sceptical, but also intrigued. $549 is a lot to pay for a speaker to 'enhance my television viewing experience'. Then again, I *do* watch a lot of telly and I've noticed an increase in 'senior moments', where I can't make out what was just said. At Bose, they lament the fact that TV image quality has improved while audio quality has remained fairly stagnant, so the Solo is supposed to dramatically improve dialogue, music and sound effects from your TV. The speaker is specifically designed to sit under flat-screens of up to 40 or 42in in size, but will work with any TV.

ONLINE www.bose.com.au

$325

CamOne infinity

You could be forgiven for thinking this tiny camera is just a toy – it looks like it's part of a 'Barbie's camera' pack. But hiding in this 77g camera body is a 5MP sensor that records Full HD video. It has a 1.5in screen, USB, HDMI, two microSD slots and an LED flash. Also unusual for a camera this size is its use of interchangeable lenses. You can mount the camera to a helmet or handlebars and even take it to a depth of 40m.

ONLINE www.camonetec.com

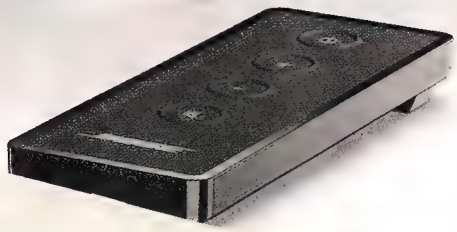
$200

Belkin @TV Plus

These days I watch as much TV on trains and buses as I do at home, so Belkin's @TV device might save me a lot of hassle. I used to muck around with the PC to get videos onto my smartphone, but @TV seems a much simpler solution. With it, you can get content from your TV to your tablet or smartphone, be it live TV or content from set-top boxes and DVD players. Once you've installed the @TV app, the unit can talk to your devices over a Wi-Fi network – when you've sent the content to your phone or tablet, you can watch it at your leisure, no network connection necessary.

ONLINE www.belkin.com/au

$549



Mi-Zone tag

I've seen loss prevention devices for smartphones in the past, but they involved sticking the phone into a chunky case. This solution is much more elegant. The Mi-Zone tag is a small proximity alarm you attach to your keys or pop into your handbag. It keeps track of its distance from your phone via Bluetooth – if your phone moves out of range, an alarm on both the tag and the phone will activate. The Mi-Zone has a 50-hour battery life and works with up to three devices.

ONLINE www.iworldaustralia.com.au

$160

Kobo Glo

I'm reading so many books on my iPhone I'm considering forking out for a dedicated ebook reader. There are plenty to choose from, but the new front-lit Kobo Glo caught my eye. The 6in, XGA touchscreen lights up for nighttime reading and is adjustable, so you get just the right brightness. I love that you can mark your ebooks with annotations, notes and bookmarks. You can also change the font size, style, sharpness and page margins. The Glo weighs only 185g and can store about 1,000 books. That should keep me going for a while.

ONLINE www.kobo.com

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FEATURE

INTEL UNLEASHES ITS MEGA-TABLET

We've seen the future of the PC and it's a giant tablet. David Flynn reports from Intel's Developer Forum.

With a 20in multitouch screen and tipping the scales at more than 5kg, Intel's vision for the next wave of all-in-one designs will see a sleek desktop become a superslab tablet. Intel calls it the 'adaptive all-in-one' computer. We call it Tabletosaurus Rex. And whether this massive tablet will truly adapt and flourish or face extinction is at best a 50/50 bet.

Here's the elevator pitch: a big battery pack is built into the screen of the all-in-one, so the entire display unit – which contains the same core technology as a laptop – can be undocked from a desktop cradle, transforming it into a tablet. A very big and very heavy tablet, to be sure, and not one you'd take to the cafe. But certainly a tablet that can be taken to a different room or out on the back deck. Think of it less as portability and more as transportability.

It appears at odds with Intel's championing of a laptop – and these days, that means an ultrabook – for everybody. However, the company has also been pushing all-in-one desktops as a family PC, especially one that can be used by the kids, and it seems this as another wrinkle to the formula. Admittedly, it could be a neat way to browse the web and catch up with the morning news at the breakfast table (just be sure it's a big table) – by reclining the mega-tablet back onto its inbuilt kickstand and touch-surfing your way through your favourite sites.

For Intel, the adaptive desktop model doesn't need to be a hit. What counts right now for Intel is that it's seen to be innovating on the tired desktop turf as well as in the hot-to-trot mobile space. "There will be more innovation in the PC in the next 12 to 18 months than we've seen in the past decade," Intel executive Kirk Skaugen says.

Another of those innovations is the use of hand gestures rather than physically touching the screen – a handy trait when you're browsing over breakfast, especially if French toast is on the menu.

"The all-in-one will recognise the position of a user's hands, fingers and even the joints of the fingers over a range of six inches [15cm] to three

feet [90cm] from the screen and can do so in three dimensions – up and down, left and right, back and forward," Skaugen says.

It will also be able to respond to preset static hand poses and gestures. The key to this is a 3D webcam developed by Creative Technology. Right now it's an external unit that sits atop the screen and plugs into the PC's USB port, similar to the first webcams.

Skaugen has no doubt that like those early webcams, the technology will quickly shrink and be integrated into the PC's housing itself, sitting directly above the screen. He considers Sony's VAIO Tap 20, which the Japanese manufacturer has dubbed a 'desktap' system and will ship later this year with Windows 8, a poster child for the new category.

"This is relatively mobile and we're getting many, many hours of battery life already using third-generation Core processors" Skaugen explains. "It will be thinner and incredibly mobile with fourth-generation Core technology."

New, low-power CPUs

Intel hopes to leave its battery-guzzling past behind with its newest processors.

Intel says its revolutionary next-generation processor could be used to debut an all-new brand name to slot in between the current Atom and Core families. Last week the chip-making colossus the revealed first details of the chip, which is built on the fourth-generation 22nm Core architecture codenamed Haswell.

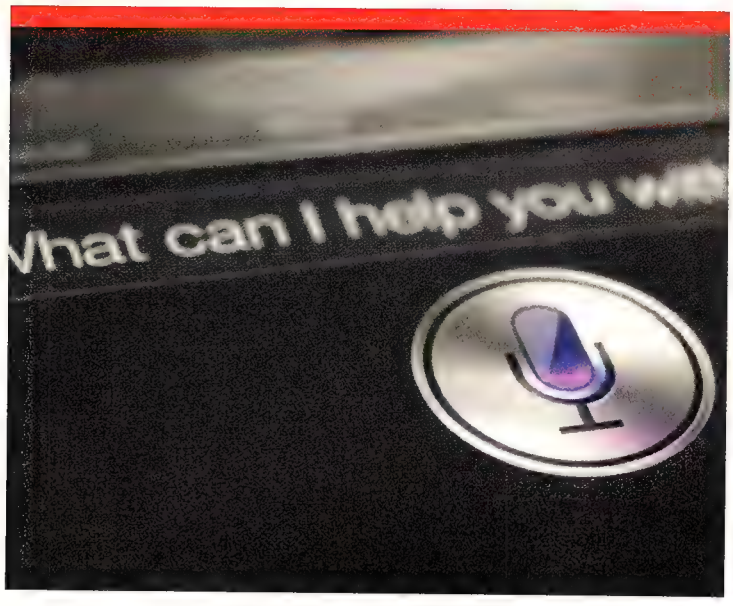
The processor draws just 10W, compared to the 17W of today's most parsimonious ULV Core designs and 2W for the mighty mite Atom. It's intended to drive a new wave of 'convertible' tablet/ultrabook designs.

"This is a new processor family that we'll target at convertibles," explains Intel's Kirk Skaugen, "with a 41% reduction in processor power, but with performance burst capabilities far above what Atom or ARM could deliver."

He says Intel was yet to decide what name the chip would carry when it's released in the second half of 2013. "We haven't selected the brand yet. We think this is game-changing technology and the convertible category could last for the next decade, so we want to consider all possibilities." Skaugen says the highly recognised Core brand, which Intel launched in 2006, "is obviously a strong contender".

Siri for ultrabooks

Siri-style voice assistance software is coming in the next generation of ultrabooks.



Intel wants you to talk to your laptop and is planning to incorporate voice assistance in the newest line of super-thin and light ultrabooks going on sale in the first half of 2013.

Developed in conjunction with Nuance and based on its Dragon Voice Recognition engine, the Dragon Assistant app lets users search the internet, play music (including specific artists and albums as well as playlists and genres), update their social network status and check and reply to email.

Demonstrating a beta of Dragon Assistant at the Intel Developer Forum in San Francisco, Intel executive vice president Dadi Perlmutter said the app was part of Intel's work in "redefining the computing experience".

The app won't be available to the general public, however – the only way to get it will be to buy a new ultrabook built on the fourth-generation Core platform.

"Dragon Assistant will be sold by Intel to ultrabook manufacturers – it won't be sold to the public," Kirk Skaugen says. It's also unlikely to debut on lower-priced ultrabooks. "Our premium ultrabook reference design will include Dragon Assistant," he says.

"Doing high-quality voice is a very complicated design issue; it's almost an art," explains Karen Regis, Intel's director of consumer client marketing. "For example, you have to make sure the microphones are placed in certain locations away from components that may generate noise."

Regis says Dragon Assistant would ship with support for "nine different languages and we're looking to add at least two more next year", although it wasn't known if the uniquely Australian version of English would make the first cut.

Barebones 4x4

Among its IDF announcements, Intel unveils tiny barebones PCs.

Intel is dipping a tentative toe into the barebones waters with an innovative pico PC design slated for sale through its distributor channel this year. Officially called 'the Next Unit of Computing', but dubbed the '4x4' for the 4in² dimensions of the motherboard, Intel expects an assembled baseline system to sell for US$399 with a Core i3 mobile processor, 2GB of RAM, 40-50GB solid state drive and wireless networking card.

The company is quick to point out that it's not about to release an Intel-branded PC. "Intel is not getting into the PC box game," says John Deatherage, Intel's director of product marketing, who demonstrated the pint-sized system to *APC* at the second day of the Intel Developer Forum.

The 4x4 won't be sold direct to consumers, although Deatherage expressed little doubt that hobbyists with a DIY bent would track down the systems to cook up a homebrew media centre or a similar bespoke box. "We'll sell this through the normal channel model, just like we will Intel motherboards to distributors and system integrators," he tells *APC*.

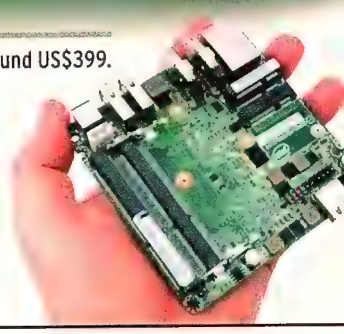
What sets the 4x4 apart from other Intel motherboards, apart from its diminutive form factor, is that the chipmaker will also offer a choice of two boxes. Identical in size and designed around the 4x4's footprint, there's a red chassis for consumer use with a full-size HDMI port and Thunderbolt connector, while the black box sports a Gigabit Ethernet jack and two HDMI ports. Both boxes come with three USB 2.0 ports.

"This barebones configuration has the motherboard, chassis and power brick – that's kind of new for Intel," Deatherage says.

The 4x4 board comes with a third-generation Core i3 processor, a pair of SO-DIMM slots, which can support 16GB of RAM each, and two mini-PCI slots, which would typically be used for a mobile SSD unit and the other for a Wi-Fi card.

"We'd like integrators to be able to sell the whole system from a price point starting at US$399 for a basic configuration with everything but the operating system. It's for somebody who needs horsepower in a very small space."

An assembled system based on a 4x4 is expected to retail for around US$399.



Deatherage sees typical applications including digital signage, embedded systems, point of sale, kiosks, surveillance and security.

David Flynn attended the Intel Developer Forum in San Francisco as a guest of Intel. atc

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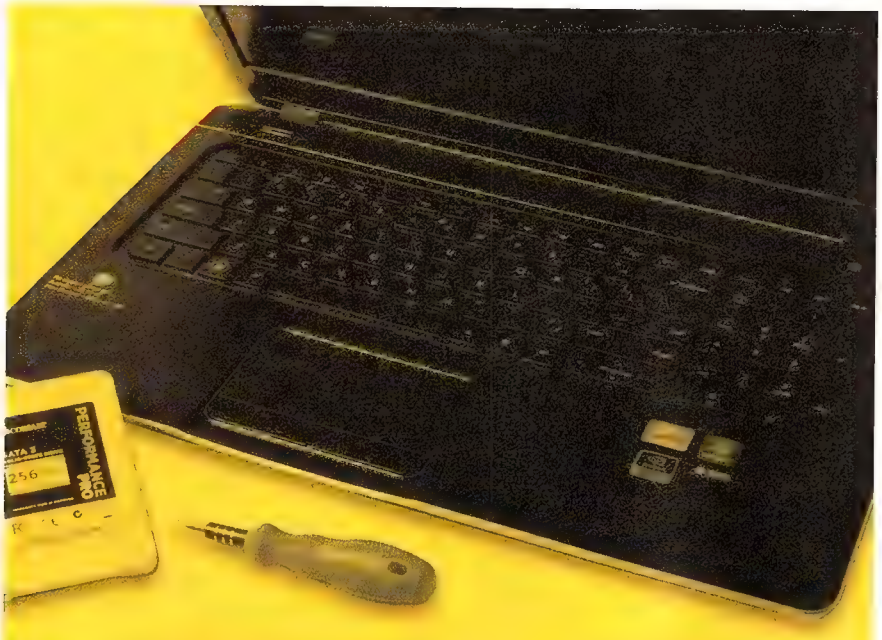

INSTALL TOO COMPLEX

Loved the article on SSDs — less-than-impressed with 'Install your OS'.

I read the article on SSDs (*APC* October, page 36), jumped straight in the car and came home with two shiny new toys: SSDs at less than $1 per GB! The time had clearly come. I picked up the Editor's Choice OCZ Vertex 4 256GB for my main box and a 128GB OCZ Octane ($69) for my seldom-used, SATA II laptop.

Then I read the 'Install your OS' section (page 52). I found it painfully complex. So I looked around for a decent tool, thinking I'd buy something modern with a good rep. I found the MiniTool Partition Wizard at **download.cnet.com**, where it's currently ranked as the 27th most popular download. And it's free.

It worked a treat. I didn't need a boot disc in the end; most actions that would require a boot disc can just be scheduled to run automatically at the next boot. I had to reboot a couple of times more than strictly necessary because MiniTool wouldn't let me do anything really dumb. My bad, not theirs.

Their web site could use some work. I tried to buy the Pro version and got the flick during the PayPal session. The Pro version allows you to boot and run from USB, stuff like that. So, if you guys have already reviewed this product, my apologies. If not, you need to get off your geeky butts and try it out. Right up there with CCleaner in terms of must-have free tools.

BTW, the performance improvement on my laptop was stunning. Improvement on my main box was noticeable, but my WD Black was already bloody quick.

Stuart McCormack | Cheltenham Vic

LIKE A FERRARI

Thanks for your piece on SSDs last month (*APC* October, page 36). I rushed out and got your Editor's Choice, the OCZ Vertex 4 and installed it following your instructions. I must tell you, the change in performance in my PC has been extraordinary.

After a week of using my upgraded PC I went back to work to an old HP PC with a mechanical hard drive. The difference in performance was so marked at first I thought there was something wrong with the HP. Programs seemed to take forever to load and things seemed to execute really slowly. It reminded me of the time I was lucky enough to test drive a Ferrari in the late '90s and then got back into my Ford Falcon sedan and thought there was something wrong with its handling, which all of a sudden seemed unusually floaty and wobbly.

John Price | Adelaide SA

THE FIRST UNIVERSAL LAPTOP?

Thanks for your excellent article about Raspberry Pi (*APC* October, page 110). At last the tide of endless gadget vanity and computer waste is being turned, and those who just want a simple system that connects to browsing and email with a free OS now have this in sight. This could be the first universal $100 laptop, when finally put together in that form – or configured as an affordable no-frills desktop system. And beyond that, it's an educational tool so very accessible to so many of all ages.

Were Steve Jobs alive, he'd eat his heart out (and others in the over-designed IT/connectivity vanity trade).

Paul Clifford | From the internet

CRYPTIC NAMES

Over the years I've collected a stack of software, but with the cryptic names that some software has, I'm at a loss to recall what some of it does. It would be great if Microsoft and Apple both required software packages to give a brief explanation of their function when you mouse over the executable.

For instance, six years after installing the program MicroStation, I wondered what it did. So starting it up, I found it was a CAD package, and seemingly a good one at that, but the name for a non-CAD person meant nada. Same with Scrivener. If I wasn't a writer I'd be at a loss.

So it would be good if each executable had a tooltip that would tell me, for example, 'Scrivener: writers' drafting, composing and story-boarding package for technical, fiction and general writing.' And 'Microstation: 2D and 3D CAD professional production package for product design, engineering, architecture, facilities management and plant design.'

You got that marketers and software developers?

Clive Walters | From the internet

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TECH PRODUCT RECALL SHOCK

Dodgy electrical components were behind several computer products recalled in the last 12 months.

You'd think GPS devices sold by Rural Fire Brigades Association of Queensland (RFBAQ) could be trusted to be a reliable way to get around in the back blocks of the state, particularly if a bushfire happened to be nearby.

The association sells a variety of electronic gadgets rebranded under its own name, including a range of GPS units from Taiwanese electronics maker MediaTek. But this year, the RFBAQ was forced to recall the GPS devices because they could cause electric shock, or worse, a fire. The MediaTek Mt3351 GPS, RFBAQ-branded units came with wall power plug chargers that breached relevant electrical safety standards and had no electrical safety approval number, according to the ACCC's Product Safety Recalls site.

If you tried to charge one at a power outlet in the Queensland bush, there was an outside chance you could find yourself calling the RFBAQ afterwards to report a fire.

Another group you'd expect to trust implicitly would be makers of powerline Ethernet adapters, which you plug into a power point and into your computing gear to set up an Ethernet network over your household powerlines.

Simple to set up and delivering huge bandwidth, these are a great alternative to Wi-Fi, particularly in homes with home theatre networks shifting big files across devices, or where Wi-Fi range is limited.

What you *don't* expect is for a powerline adapter to deliver an electric shock, particularly if it's made by renowned networking company Netgear. In fact, the one thing you *do* expect is that the safety issues would be the first thing taken care of before anything else in the design of the product.

Yet, late last year, Netgear had to recall a powerline AV+ Ethernet adapter (model XAV2501) which was supplied as part of a kit. The offending adapter had incorrectly attached internal wiring in the AC passthrough circuit, with the active and earth wires inverted.

According to the Product Safety Recalls site, this meant that 240V AC current would be present on the earth terminal of the passthrough socket outlet and the active terminal would be grounded to earth. This would present danger of a shock if the device plugged in to the socket had a three-prong AC cable and the cable was attached directly to the plugged-in product, not through an external ac-dc power adapter *and* the plugged-in product had an earthed exposed metal surface.

"In the above circumstances, exposed metal surfaces of the plugged-in product will be at a voltage of 240V AC. Any person touching the plugged-in product would therefore experience an electric shock," the site wrote.

And definitely the last product you'd expect to be a fire hazard would be a Lenovo all-in-one computer, the kind of family-friendly unit you place in your bedroom or kitchen. But this year Lenovo was forced to recall its ThinkCentre M90z all-in-one, due to a faulty power supply.

According to the Recalls site, "Some metalised capacitors inside the power supplies may be defective, leading to possible overheating and smoke. There's a potential fire hazard as a result of overheating of the product."

The lesson from these, and most of the other computer recalls, is that while electronic devices are generally safe, manufacturing faults can slip through and it pays to be vigilant. Every time you leave a laptop on charge overnight, for instance, you should assess its surroundings for how quickly a fire would spread should the battery or charger overheat and melt down.

ENDUSER

Share the hilarity!

Do you work in the IT industry and are forced to deal with inept and clueless end users on a daily basis? Do you have an IT professional, who isn't that 'professional'? If you have an interesting or amusing story, email us at contact@apctest.com. All correspondence becomes the property of APC and is subject to editing. Letters must include writer's full name, street address, suburb, state and phone number to be considered for print publication. Address and phone details will not be published.

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3.) Astronomy: a point in the sky towards which a star stream appears to move

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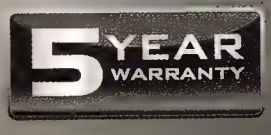

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9/10 Apple iPhone 5

A powerful update to Apple's signature phone, but not everyone will love it.

SMARTPHONE

www.apple.com/au @

16GB, $799; 32GB, $899; 64GB, $999 $

Powerful processor, incredible screen, very light. ✔

Change in dock connector, bigger screen doesn't make much difference. ✖

Apple's latest iPhone iteration held few surprises at its launch, as pretty much all the details surrounding it had leaked months beforehand. While some may be disappointed that it doesn't radically reinvent the iPhone concept – merely stretch it out a little to accommodate the 4in 1,136 x 640-pixel Retina display that's still easily the best-looking screen you can get – what Apple's done here is a refinement of an existing concept rather than a complete reimagining.

The build quality genuinely is exceptional. Gone is the horrible glass back of the iPhone 4/4S, replaced with an aluminium back in either black or silver, depending on whether you've opted for the black or white model. The 30-pin dock connector has also gone and Apple is *selling* adapters, rather than throwing one in the box. The new Lightning connector is light and reversible, so you can't plug it in the wrong way, but it's also USB 2.0 only at this stage; it's hoped Apple may release a USB 3.0 or Thunderbolt version later.

The longer screen allows for easy single-handed use if that's important to you, but the changes in apps aren't that exceptional to date. Unless they're updated for the 4in display, you get a letterbox effect around all apps. On the black model it's barely noticeable, but on the white it stands out quite a bit.

It's also LTE 1,800MHz capable, which means those on the Optus or Telstra network can get much better speeds in selected areas. To date, Optus's newer network is a lot faster, but then it can't claim the half a million or so customers or regional reach of Telstra's networks. Our testing with both Optus and Telstra phones certainly saw the iPhone 5 outpace a 3G connection in most LTE locations, with speeds peaking up to 40Mbps down/23Mbps up, including testing Telstra in both the Sydney CBD and regionally in Armidale, NSW. Optus currently has larger installed sites in Sydney, Perth, Melbourne and Newcastle, but that's it.

Of more concern was the battery hit that adding LTE would create, but after testing, it seems that the power refinements of the A6 chip underneath really do have an effect. Running an iPhone 4S and 5 head to head over a day in an LTE area saw the 4S die out around two hours before the iPhone 5. As always, heavy use of any smartphone can run it out within a day.

From a benchmark perspective, the dual-core A6 processor underlying the iPhone 5 is a speedy beast, scoring a hefty 1,563 in Geekbench for iOS. By way of comparison, the 4S managed 637 in the same benchmark and the now obsolete 3GS reached a more meagre 287. The SunSpider JavaScript benchmark (where lower scores are better) saw similar results, with the iPhone 5's score of 927ms a huge improvement over the 1,833ms of the 4S and 4,884ms of the 3GS. Compare that to a quad-core Samsung Galaxy S III, which scored 1,448ms in SunSpider and 1,279 in Geekbench.

So should you buy one? Long-term iOS fans with older handsets than the 4S most definitely should. This is a well-built refinement of the iPhone concept and at this stage in the product's maturity, that's to be expected. Those who already have the 4S may want to hold off; with the exception of a few features like taking stills while shooting video on the iPhone 5, many of the key 'new' features are part of iOS 6 (including the woeful new Maps app) rather than the phone itself. If you're in the broader market for a smartphone, it's certainly a premium choice for those who want a single-handed phone. If you truly want a large-screen phone, there are alternatives with much more scope, albeit with lesser-quality display screens.

Alex Kidman

8/10 ASRock Z77 OC Formula

ASRock fronts up to the top-tier manufacturers.

MOTHERBOARD

www.asrock.com @

$350 $

Good build quality, easy-to-use BIOS. ✓

Rapid OC buttons require software to be installed. ✗

ASRock is a brand that divides enthusiasts' opinions – some people swear by its boards, while others swear at them. The latest premium offering from ASRock is its ultra-high-end Z77 OC Formula.

This is a good-looking motherboard with gold slots that contrast nicely against the jet black PCB; there's an elegance here we haven't seen from ASRock before. The board is unexpectedly heavy, primarily due to the weighty PCB and main heatsink, which features water cooling capacity.

Officially, the OC Formula supports up to 32GB of memory at 3,000MHz, but few CPUs are capable of achieving such frequencies, so don't be disappointed if you don't get close to that number. Also on board are a massive 10 SATA ports, 10 rear USB ports and 7.1-channel audio outputs. Supporting up to three-way multicard graphics configurations are three full-length PCIe slots with an additional two 1x slots.

There's no doubt then this board is targeted towards overclockers, from the OC name to the dedicated onboard switches and voltage measure points. We like the addition of the adjustable up and down buttons, allowing quick and convenient CPU frequency adjustments. Unfortunately, this requires the Rapid OC software to be installed, but it does work quite effectively. ASRock has brought together quality components, a reliable BIOS and a great overclocking feature set with the OC Formula. The result is a competitively priced motherboard that's going to change enthusiasts' opinions of the ASRock brand.

James Trevaskis

8/10 Billion BiPAC 7800VDPX

Billion comes roaring back into the router business.

MODEM ROUTER

www.billion.com.au @

$199 $

A huge feature set with all the mod cons, built-in VoIP. ✓

Not really suitable for non-technical users. ✗

Once the darling of many a technical user, Billion was known for its feature-rich, highly configurable routers. Sure, the routers weren't very friendly to neophytes, but hardcore users loved them. Then the product releases slowed to a trickle and stopped altogether. The existing routers were still selling, but new models were nowhere to be found.

Meanwhile, other router vendors made their products more capable and easier to use, and Billion disappeared from the general consciousness. Now it's back with the 7800VDPX, a router that tries to be all things to all people. It's a VoIP router, with full PSTN failover and two phone ports. It's an ADSL router, but you can reconfigure a LAN port as a dedicated Gigabit Ethernet WAN port, so you won't have to throw it out when the NBN comes along. It's a Gigabit Ethernet switch and a dual-band 300Mbps 802.11n wireless access point to boot (sadly, no 450Mbps yet). It even has a USB port for shared storage and printers, with both Samba (Windows File Sharing) and DLNA support.

Some things haven't changed, however. The administration interface is still likely to be terrifying for neophytes and awesome for hardcore techies. There are an incredible number of options to work with and if you like, you can really drill down into minutia like QoS rules, TR-069 management and some quite sophisticated VoIP settings. If you want an affordable router with every feature under the sun and an interface that lets you tweak it to the limit, this a go-to product. However, we still think the similar AVM Fritz!Box Fon WLAN 7390 has it a little bit more together – both from a hardware and design standpoint. On the latter score, the 7800VDPX won't win any awards, being huge and ugly. But it's feature-rich and capable, and if you've liked Billion routers in the past, this is totally in the Billion style, modernised and ready for the NBN.

Nathan Taylor

7/10 Tt eSPORTS Level 10 M

Pretty on the outside, ugly in the middle.

GAMING MOUSE

mmouse.ttesports.com @

$110 $

Looks pretty. ✔

Unwieldy, heavy and limiting. ✖

We don't ask much from our gaming mice. In fact, there are only a couple of primary factors we look for: comfort and performance. Can I use this for an obscene length of (continuous) time and will it do everything I ask of it smoothly and accurately? We don't really care how it looks.

That is, until the Level 10 M dropped onto our desks and confounded us not so much by its stylings, but by the strange mismatch of collaboration between Tt eSports and BMW DesignworksUSA. Looking like it just rolled onto a showroom floor, it's impressive to behold. Build to withstand anything, the base plate is a solid piece of aluminium with the functional clicky bits seemingly floating above.

The mouse features 11 fully programmable buttons (via the included software) as well as a profile toggle on the left side for switching between dpi levels, from 800 through to 5,000dpi at the top end. It also takes a nod from Cyborg's R.A.T range of mice – there are two screws on the chassis that raise, lower and tilt the 'palm' section.

Out on the road (well, the mat), the entire top section shifts and rolls, similar to a car's body taking tight turns. It's only subtle, but it really does add to its ergonomic rating. Likewise, the layout of the buttons makes sense and they all feel comfortably accessible.

Unfortunately, the mouse's limitations lay in its size and weight. Coming in at a whopping 147mm long and 67.5mm wide, even to this larger-handed reviewer the Level 10 M felt about as responsive and wieldy as a three-wheeled iceberg. If you're intent on taking the plunge, be prepared for a fairly lengthy break-in; even after a couple of weeks, we're still not sure if we like it. Actually, we're pretty certain we don't.

Troy Coleman

8/10 Logitech G600 MMO

G is for grinding.

GAMING MOUSE

www.logitech.com @

$80 $

Customisable buttons, profile switching, fair price. ✔

Steep learning curve, too many options. ✖

While we're pretty much drowning in MMO-optimised gaming keyboards, there's only really one mouse – Razer's Naga and its mutant variants – that caters to this huge subset of gamers. Logitech has finally waded into the MMO fray with the G600 and it's a mouse that's clearly been inspired by Razer's approach. The appeal to both of these pointers is basically the same as with an MMO keyboard: there's a bunch of macro-capable and customisable thumb buttons that can instantly execute a chain of keystrokes, allowing you to create intricate special attacks and combinations that'd otherwise require superhuman finger dexterity.

However, the G600's 12 thumb buttons are differently designed to the Naga's and they arguably work a bit better. It's more like having two sets of six, with each set curving inward in the middle like a little oblong bowl. This gives you two discrete positions to rest your thumb and each button's different shape and slope angle does, with a bit of practise, make it easy to identify without looking.

Logitech's also kitted out the G600 elsewhere, with profile switching letting you completely redefine all button functions instantly, plus a third finger button for your ring finger. And like all of Logitech's high-end gaming mice, this one also includes on-the-fly sensitivity switching, going from 200 to 8,200dpi. We're not entirely sold on that third button – the ring finger isn't the most dexterous and we're used to gripping and stabilising our mice using it – but that's obviously down to personal preference.

Overall, the G600 is quite comfortable – its wide shape offers a nice, flat surface to rest your hand on for those long hours of loot grinding. Reaching the rear set of buttons can require you to shift your whole hand back (even if you've got short, stumpy thumbs), but that's the same on the Naga.

While the G600 isn't quite 'pick up and play' (there's a definite learning curve here), it does stack up surprisingly well as an alternative to the Naga. The fact that it undercuts the latter by a good $5-10 doesn't hurt either.

Dan Gardiner

7/10 MSI N650 PE 1GD5/OC

The GeForce GT 640 gets a memory boost.

GRAPHICS CARD

au.msi.com

$155

Very cool under load, rich feature set, decent performance.

Can't keep up with AMD's cheaper Radeon HD 7770.

The Kepler architecture powering Nvidia's latest performance parts has done a stellar job of delivering blistering speed without blistering temperatures. This low-temperature, power-efficient design has seen the GTX 680 and 670 becoming the flavour of the month, although the same can't be said of Nvidia's lower-end offerings. Despite the new GT 640 using a cut-down version of Kepler, the hobbling use of GDDR3 memory has kept performance well below AMD's budget offerings. Nvidia's hoping its new GeForce GTX 650 can solve that, primarily by sating the GT 640's thirst for memory bandwidth.

The GTX 650 uses the same GK107 GPU that powers the GT 640, which is constructed of two Kepler SMX units. The GTX 680 uses eight, suggesting we'll now have a quarter of the raw computational performance. There's a slight speed boost when moving from the GT 640 to the GTX 650, increasing from 900MHz up to 1,058MHz – a mere 18% jump. Unlike the faster Kepler cards, the GTX 650 doesn't use Nvidia's proprietary GPU boost technology, which means you're stuck with these speeds unless you don't mind dabbling with overclocking. The MSI variant we've reviewed here is the overclocked version, but the factory overclock is tiny, with the frequency increase to 1,084MHz barely noticeable.

The GTX 650 GPU is built using the same 28nm process as all Kepler GPUs, keeping power requirements low, and the resulting TDP is a mere 64W. This makes it one of the coolest cards on the market and perfect for the challenging thermal conditions inside a small form factor or home theatre PC. There's no need to strap a turbofan to such a chilly chip; our MSI review sample had a heatsink that pumped out just 34dB of noise under load, making it very hard to hear when it's inside a case. The use of the Kepler design makes this card fully compliant with PCIe 3.0, though at this price level we don't expect performance worthy of the connection.

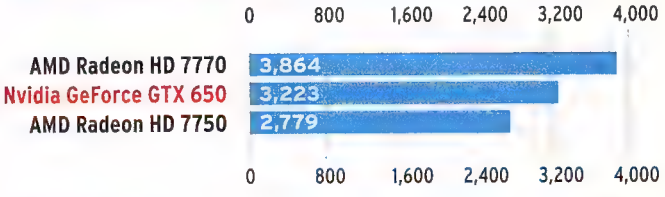
Where the GT 650 differs most from the GT 640 is the type of memory used. Gone is the cheap GDDR3 memory that bottlenecks the GT 640 so badly, replaced by a gig of speedy GDDR5 memory running at 1,250MHz. This triples the memory bandwidth over the GT 640. 2GB versions will also be available for memory-hungry games.

We tested the GTX 650 in a high-end rig to ensure the rest of the platform wasn't the limiting factor and faced it off against the Radeon HD 7750, which Nvidia claims is its closest rival. However, at the time of writing the MSI GTX 650 was more expensive than the cheapest HD 7750 ($100) on the market, so we also measured it up with the Radeon HD 7770 ($125), which is a closer match. We're glad we did. As you can see from our benchmarks, the GTX 650 has a healthy lead over the HD 7750 in all tests. Given that the GTX 650 is more expensive than the faster HD 7750, it's obvious that at present, the Radeon card is the better buy. However, street prices of the GTX 650 should drop sharply over the next few months.

Bennett Ring

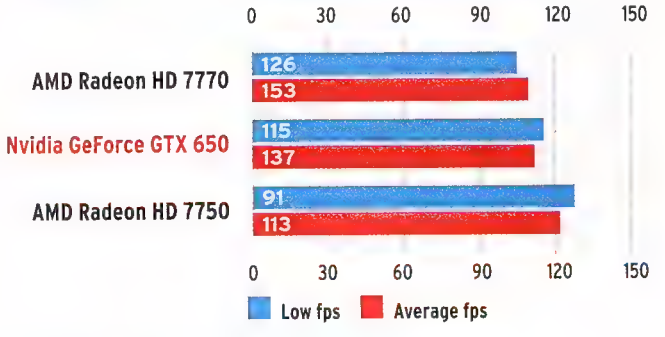
3DMARK 11

Performance test: 1,280 x 720 (overall score)



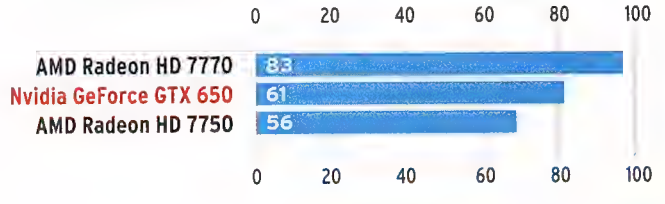
DIRT 3

Performance test: 1,280 x 720 (medium details)



TOTAL WAR: SHOGUN 2

DirectX 9 Balanced test: 1,280 x 720 (average fps)



7/10 Sony Xperia Go

Durable and attractive, but the performance is a little wet.

SMARTPHONE

www.sonymobile.com @

From $30/month on 24-month Optus contract $

Slim, very durable, works when wet. ✔

Average performance. ✖

Most 'rugged' phones look as though they've fallen off the back of a Soviet-era tractor. Sure, they can take a few bumps, but they're not exactly blessed with brilliant good looks.

Sony's Xperia Go bucks that trend, offering up an IP67-rated Android 2.3.7 phone within a sleek case that's evocative of – but not quite similar to – Sony's other current Xperia lines. Those who desire a smaller phone may like its 3.5in touchscreen, although that's bucking the general Android trend.

Its durability is exceptionally good. We tested dunking it in water, running it under taps and throwing it into sand, and grime aside, it worked well afterwards – we could even get it to run apps while having water running over it. Not that this is the point of durability in a phone, mind you, but it's undeniably a great party trick.

The Xperia Go is durable, but you couldn't really call it a performance machine. Its 1GHz dual-core processor is capable, but not stunning, returning a Quadrant score of 2,570 and a Geekbench 2 score of 850. It's currently only running Gingerbread, although Sony promises Ice Cream Sandwich by the year's end. Storage is limited to 8GB internally, so investing in a microSD card would be a wise step.

The Xperia Go is an Optus exclusive on a cheap $30 plan, which is about right for the performance set, and the durability is something of an added bonus.

Alex Kidman

7/10 Creative Sound BlasterAxx SBX 20

Can you teach an old dog new tricks?

SPEAKER

au.creative.com @

$240 $

Unique voice features, dedicated apps for major platforms, good audio projection. ✔

Not quite enough bass output, Sound Blaster badging looks naff. ✖

For most old-timey PC enthusiasts, Sound Blaster is a name synonymous with the pioneering days of PC audio, but with on-motherboard audio now doing the sound job for most people – and sound card sales basically flatlined since 2008 – the Sound Blaster name just ain't what it used to be.

Creative's hoping to rejuvenate its flagging brand by going in a whole new direction, targeting the new cutting edge of wireless audio for smartphones and tablets. So is it worth getting back together with this reinvented old flame, or is it time to finally let go?

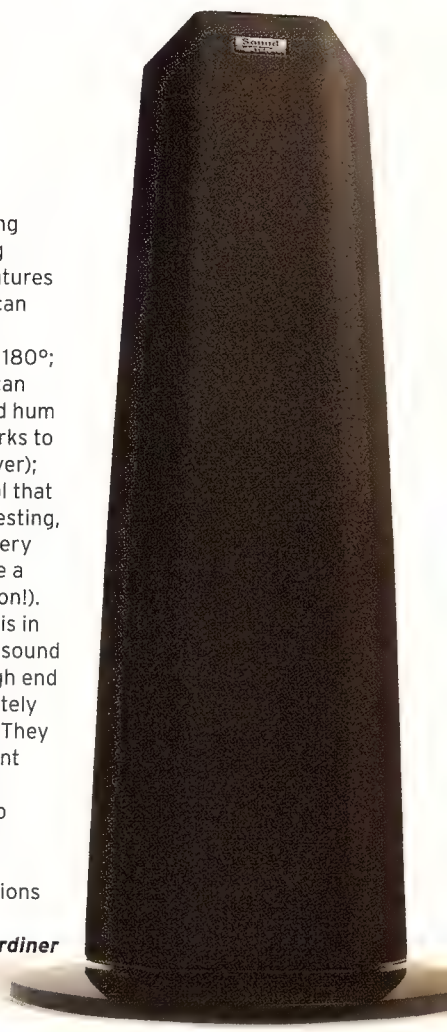
The SBX 20 is the 41cm tall flagship of the new Sound BlasterAxx range, packing a set of angled stereo speakers and a high-quality mic with Bluetooth connectivity. It's powered by an included USB cable (a wall wart adapter is also included), which makes it flexible with regards to where you can use it. Pretty much anyone can do a Bluetooth speaker these days and the SBX 20 distinguishes itself by adding smarts. Creative's included a dedicated audio processor inside that can be controlled via a dedicated app (available for iOS, Android, PC and Mac).

Along with an equaliser for adjusting audio output, the processor adds a big selection of voice communications features and enhancements. Its parabolic mic can record things in an adjustable arc, for example, going anywhere from 20° to 180°; there's smart noise cancellation that can eliminate even the loudest background hum from your AC (it impressively even works to eliminate a vacuum cleaner or hair dryer); and there's a fun voice modulation tool that can change voice pitch and tone – in testing, we found the 'male to female' option very successfully made any bloke sound like a 15-year-old girl (hurrah for emasculation!).

Where the SBX 20 falls over a little is in music playback – while it does project sound well overall, and the mid-range and high end are adequately covered, there's ultimately not a whole lot of deeper bass output. They don't sound quite as rich as other recent Bluetooth speakers we've tested.

Those unique voice features do help mitigate that shortcoming, but if what you're primarily after is a speaker for listening to music, there are better options available at this price.

Dan Gardiner



7/10 ASUS Vulcan PRO

Packing in the feature we knew we didn't need.

GAMING HEADSET

www.asus.com.au @

$120 $

Comfortable, built from great-quality materials, travel case and airline adapter included. ✔

Way too heavy on the bass, active noise cancelling unnecessary. ✖

Out of the box and on the head, the Vulcans are a dream and are testament to what a little ingenious thought – the simple, single pivot point on the cans is perfect – and quality materials can create. The vinyl-clad cans are padded with extremely soft and welcoming memory foam. In short, you can game with this headset all day and come back for a few more frags at night.

The left can houses the toggle for the noise cancelling, as well as the jack where the removable mic plugs in. But this is a headset, so it has to be all about the sound and unfortunately, sonics aren't entirely the Vulcans' strong point. The 40mm drivers are way too heavy-handed with the bass for our liking, and while there's still a hint of definition through the mids, the trebles lack the bright feel they should have. Even with the processed 7.1 and 'fps' mode (which in theory evens out the histogram) activated on the inline controls, while a little better, our minds remained completely unblown.

We noticed no great boon when switching on the active noise cancelling either. While the depth of isolation pales in comparison to the like of the Bose QuietComfort 15s, once switched on, we did noticed a significant reduction in ambient noise. However, we also noted a general tone thickening, bass reduction and overall shallowing in soundscape – not great when gaming. The already super-snug fit of the headset provides great passive isolation from the ambient hum of PC case fans, so we really don't see the point. Included in the box is an airline adapter as well as a hard travel case to take your gaming on the road.

Troy Coleman

8/10 CM Storm Sonuz headset

Finally, a headset developed with the triangular-headed in mind.

GAMING HEADSET

www.cmstorm.com @

$67 $

Robust, decent sound from massive drivers. ✔

We expected to be able to push them harder, comfort problems. ✖

Looking every bit like the set piece ship from the *Alien* series, we couldn't shake the feeling that something would go horribly tentacled once we released the Sonuz from the box. Tuned with music and movies in mind as well as the gaming world, it's designed to be a long-haul all-rounder; the lightweight and unarguably robust headset manages to at least get one of its promises – the sound – just right.

It's unsurprising that there's very little comfort to be had within that striking, rigid chassis. It's not a weight issue, as the Sonuz is by no means a heavy beast, but on the head its natural clamping creates a weird, heavy F1-esque downward force that no matter how we tried, we could never quite overcome to get a good fit. It felt physics-defyingly heavy. At least under that oppression the huge 97mm open-cell pads improve the comfort stakes by completely enveloping the sides of your head.

On the inside is a massive set of 53mm drivers through a range of 10 to 20,000Hz. Unlike most gaming-centric headsets, which mask range inadequacies by cranking up the bass, the Sonuz histogram is fairly even across the range. We put it through its paces in *Battlefield 3*, the gorgeous soundscapes of *Saving Private Ryan* and *The Matrix*, as well as a range of music, and were impressed with how well it handled diverse sources. The Sonuz really shines through the mids and manages to nicely pull the bottom and top ends together, and while the brights may not be as crystal-clear as we like, it's still a great-sounding headset, especially given the price point.

Rounding out the features is a 3.5mm detachable boom mic, which can be mounted on either the left or the right side, along with a rudimentary set of inline controls at a comfortable distance along its 2m braided cable.

Troy Coleman

MAN VS MACHINE

Mike Bedford delves into the world of chess computers and ponders whether success at chess really constitutes machine intelligence.

The idea of a man against machine challenge in a game of chess is by no means a new one. Over the years, though, as computers repeatedly lost to the world's best human players, many scientists believed that this was one contest in which man would always be triumphant.

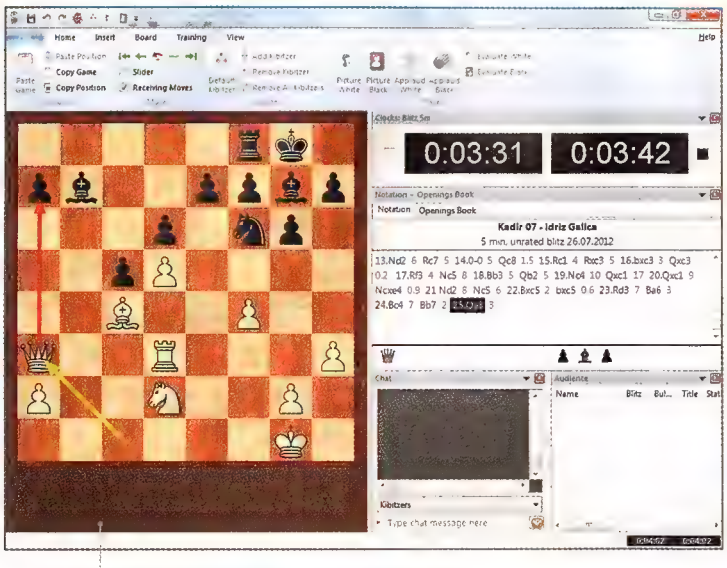
IBM had other ideas and in 1989 hired Feng-hsiung Hsu and Murray Campbell, both graduates from Carnegie Mellon University in the US, who had experience with chess playing software. The project was called Deep Blue and its aim was to beat a human grandmaster in a chess tournament. Victory was not assured. Indeed, the critics were vindicated in 1996 when Deep Blue was defeated by four games to two in a six-game match against grandmaster Garry Kasparov. This wasn't the end of IBM's prodigy, though.

A year later, Deep Blue was back for the rematch, and this time history was made. With the TV cameras running at the Equitable Center in New York and the score standing at one win each, Kasparov suffered an overwhelming defeat in the sixth and deciding game.

To understand more about the significance of this momentous achievement, we spoke to Murray Campbell, one of the team responsible for Kasparov's crushing defeat by Deep Blue. Although previous attempts had tried various human-like knowledge-based approaches to chess playing programs, it turned out that brute force was much better.

"So we need to do it the way computers do it best," explains Campbell. "Check all the possible moves and use a set of fairly simplistic rules for deciding which of them are the best."

It's easy to conclude that success at chess requires intelligence, but it's much harder to define exactly what intelligence is.



The Freestyle Chess Tournament, played over the Playchess.com online system, proved the superiority of man working together with machine.

THE DEEP BLUE APPROACH

Campbell's description of the brute force approach might sound simple, but in 1997 getting that much performance was no mean feat, even for a supercomputer. The Deep Blue machine was an IBM RS/6000 SP containing 32 x 120MHz power processors and clocking up a peak performance of 15gflops.

Even back then, an RS/6000 SP of this configuration would have been well down the league tables of the world's fastest computers and today, most decent desktop PCs would beat it hands down. However, this is ignoring an important fact, as Campbell explained. "General-purpose computers are general, they're good at everything," he says. "Hardware specially designed for chess can be orders of magnitude faster."

He went on to explain how they had designed a special-purpose chip that was specific to chess and wired no less than 480 of these custom integrated circuits into Deep Blue. This allowed common operations to be completed in a single instruction, rather than the lengthy software routine that would otherwise have been needed.

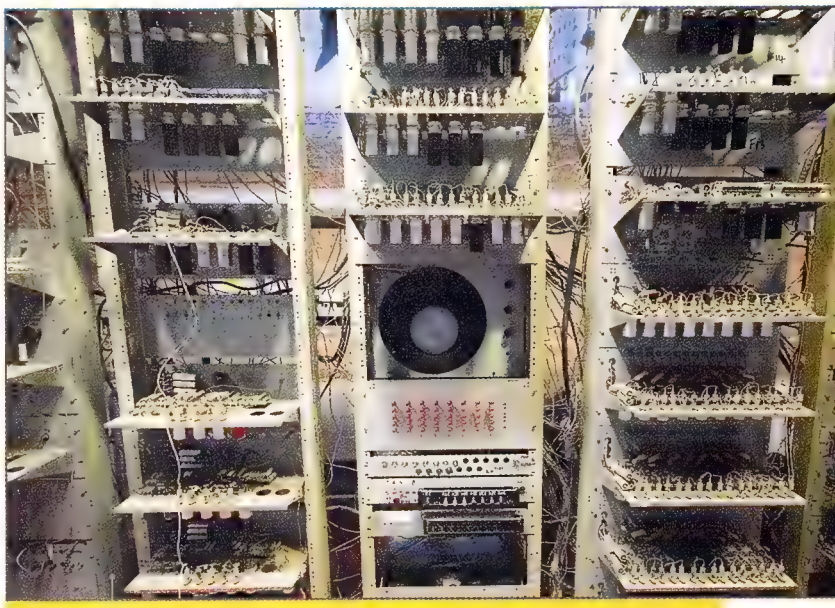
But this alone wouldn't have been enough to beat Kasparov. Indeed, describing Deep Blue's approach as employing brute force is something of an over-simplification, as an investigation into the workings of a chess playing program reveals. Campbell described how the software constructs a tree incorporating all possible positions, many moves ahead, and then determines which of those end positions is the most favourable. Next, using a technique called minimax, which was developed by economists and mathematicians, the software works up the tree from the most favourable end position to work out which move it should make next to achieve that goal. However, the number of positions grows exponentially as the software tries to look further ahead and the figures soon become mind-boggling.

GAME TERMS

First we need to introduce some terminology. So far we've been talking about moves, but this term is ambiguous, so computer chess experts use the word 'ply'. In normal chess, the movement of a piece by one player and the response by another is referred to as a single move. However, in the language of computer chess, this is two ply.

Campbell told us that, typically, Deep Blue looked ahead by 10 to 12 ply in middle games and more in end games. He also indicated that in the middle game, players have around 40 possible moves at their disposal. Therefore, at face value, that would mean ending up with almost 17 billion trillion trillion end positions, each of which have to be evaluated.

Even with Deep Blue's ability to search through 200 million moves per second, it would have taken it over 6,106 years to work out its next move. Given that the World Chess Federation allows 90 minutes for the first 40 moves, followed by 30 minutes for the rest of the game, this isn't exactly a viable approach.



Despite being based at the home of this, the world's first computer, Turing never ran his chess program on real hardware.

THE TURING PROGRAM

WHY THE OBSESSION WITH CHESS?

Considering computers were still being developed when Alan Turning wrote his chess program, it's perhaps surprising that he turned his attention to an apparently frivolous use of this up-and-coming technology. Why did the father of computing want to teach computers to play chess?

To shed some light on this question, we spoke to artificial intelligence expert Dr Gavin Brown at the University of Manchester. "Turing's work was on computation and at some point he wondered if all human thought processes were just computations," he told us.

"He wondered if he could take something that seemed like it required intelligence and reduce it to a computational process. He chose chess for no particular reason other than it seemed that very intelligent people were generally very good at the game."

Ironically, despite being based at the University of Manchester, where the world's first proper computer was built shortly after he wrote his chess program, Turing never got the opportunity to run it on real hardware. Instead, by necessity, the program was a set of detailed instructions written in English. He called it a paper machine and on the few occasions he put it through its paces, Turing himself acted as the computer, taking a 1.5 hours per move.

Given this lack of testing on a real computer, it's pertinent to ask how it stood up compared to real chess software. Was the migration to a modern PC nothing more than a simple conversion process, thereby substantiating Turing's pioneering work? We asked Frederic Friedel of Chessbase, who converted Turing's paper machine and operated the PC in that historic game against Garry Kasparov. Frederic told us it was fairly easy, but added that "the debugging almost killed us".

However, as Murray Campbell tells us, this is by no means an end to Deep Blue's sophistication. "There are a number of tricks that make the search much more efficient," he says. He explains that it's necessary to prune the least promising-looking branches from the tree and that if the pruning is carried out near the top of the inverted tree, vast numbers of possible end positions can be eliminated. "Because of something called alpha-beta pruning, only a very small portion of the possible positions actually need to be evaluated – roughly proportional to the square root of the possible positions," he says.

The explanation isn't simple, but the end result is. If we truly do end up with the square root of the number of possible moves for each ply, the number of end positions drops from 40^{12} to around 6^{12}. This is just over 12 billion end positions, which Deep Blue would've been able to churn through in around 18 seconds.

It might seem that the ability to decide which branches are fruitless involves a degree of intelligence, but it doesn't – the alpha-beta pruning algorithm follows hard-and-fast rules. But what about evaluating all those billions of end positions and deciding which are the most favourable? Surely here we're getting into the realm of machine intelligence?

Again, pure logic is all it takes. If some of the end positions represent checkmate, this is easy for software to recognise and it doesn't require a lot of intelligence to come to a conclusion on its merit. Similarly, positions can be evaluated by assigning points to the various types of chess pieces (for example, one for a pawn, three for a knight, nine for a queen and so on) and adding them up to provide a score.

Even in the end game, which is difficult because of the need to look even further ahead, tricks that fall short of exhibiting intelligence are used and today this is a fruitful area of development in the arms race between rival software solutions.

A method that's now used almost universally in top-notch software is an end game database. These include all possible end positions, up to a maximum number of pieces remaining on the board, and have a pre-computed outcome for each position: win, lose or draw. We can view this as akin to the experience human chess players gain and which gives them an intuition about the relative values of positions.

Since success in chess is often associated with human intelligence, this would suggest Campbell's creation was intelligent. However, he made no such claim for Deep Blue. "Today we'd say that playing chess alone isn't sufficient," he admits. "Today we'd say that to be intelligent, a computer has to exhibit competence across a range of activities."

CHESS COMPUTERS TODAY

A motivation to continue developing chess software is for the intellectual challenge of achieving better results. However, since this is no longer an issue when competing against human players, computer versus computer tournaments are required to put these programs through their paces.

In 1974, the World Computer Chess Championship (WCCC) started. It's now an annual event, organised by the International Computer Games Association (ICGA), and it originally permitted any hardware to be used. Since 2009, machines have been limited to eight cores, thereby excluding esoteric hardware like supercomputers and large clusters, and placing more emphasis on the software. As an example of the sophistication in state-of-the-art software, Deep Junior, the Israeli program that won the most recent championship in 2011, uses so-called opponent modelling, in which the program's moves aren't always the strongest possible, but take into account the perceived weaknesses of the opponent.

The world of computer versus computer chess hasn't been without its controversies. Earlier this year, the Czech former international chess master and programmer was stripped of the WCCC titles he'd won in 2007 to 2010 using the Rybka software. Furthermore, the ICGA banned him for life from the WCCC, having found him guilty of breaking the rules by plagiarising two other chess programs, Crafty and Fruit.

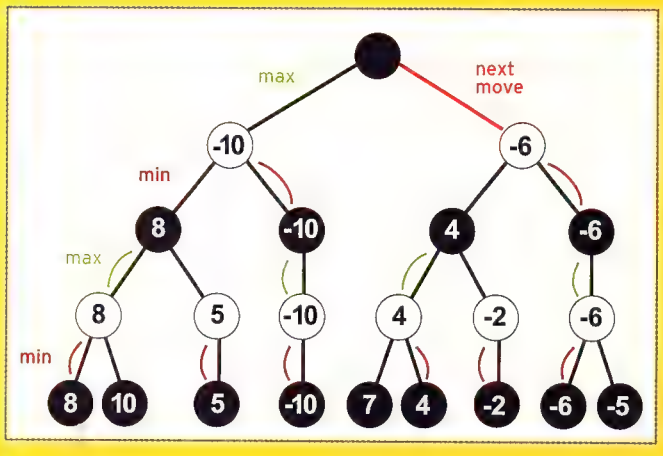
POKER FACE

"There's some interesting research in the game of poker," Murray Campbell says. "Unlike chess, there's hidden information. With chess everything's in front of you."

But the challenge of poker doesn't end there. "If the cards are against you, you'll lose however well you play, so there's an element of chance. But there's also the element of opponent assessment and this is where it gets interesting. If you decide your opponent is weak and can identify that weakness, it can be exploited."

The University of Alberta Canada's Computer Poker Research Group is one of the major players, but still has a way to go to equal Deep Blue's achievement in chess, so it seems like this is one game where mankind can rule the roost for another few years at least.

The Deep Blue challenge tested 1990s hardware to the limit in its bid to beat grandmaster Garry Kasparov.



5Chess software looks several moves ahead, but in a real chess game, the number of permutations soon becomes vast.

THE MINIMAX APPROACH

THE THEORY BEHIND THE DECISION RULE.

The minimax algorithm, which is the key to virtually all chess software, starts by listing all the possible moves that it can make. Then, for each of those moves, it considers all the moves the opponent can take, all the moves it can make in response to its opponent's moves, and so on until it reaches the maximum depth of its search, which is largely governed by the processing speed. This can be viewed as an inverted tree, a simplified version of which is shown in the diagram above. In reality, because each player could have about 40 possible moves to choose from, the number of branches grows exponentially – from 40 to 1,600 to 64,000 to 2,560,000 to 102,400,000 to 4,096,000,000 to 163,840,000,000 – and that's just looking seven moves ahead.

The software assesses the lowest-level branches and decides which outcome is the most beneficial. The task then becomes one of ensuring that result. This is done by working up from the bottom and at each junction, choosing the branch with the highest score (maximum) if it's the computer's move, or the branch with the lowest score (minimum) if it's the opponent's score, recognising the opponent will always move to minimise the software's advantage. When the last decision is made, it dictates the next move that the software should make.

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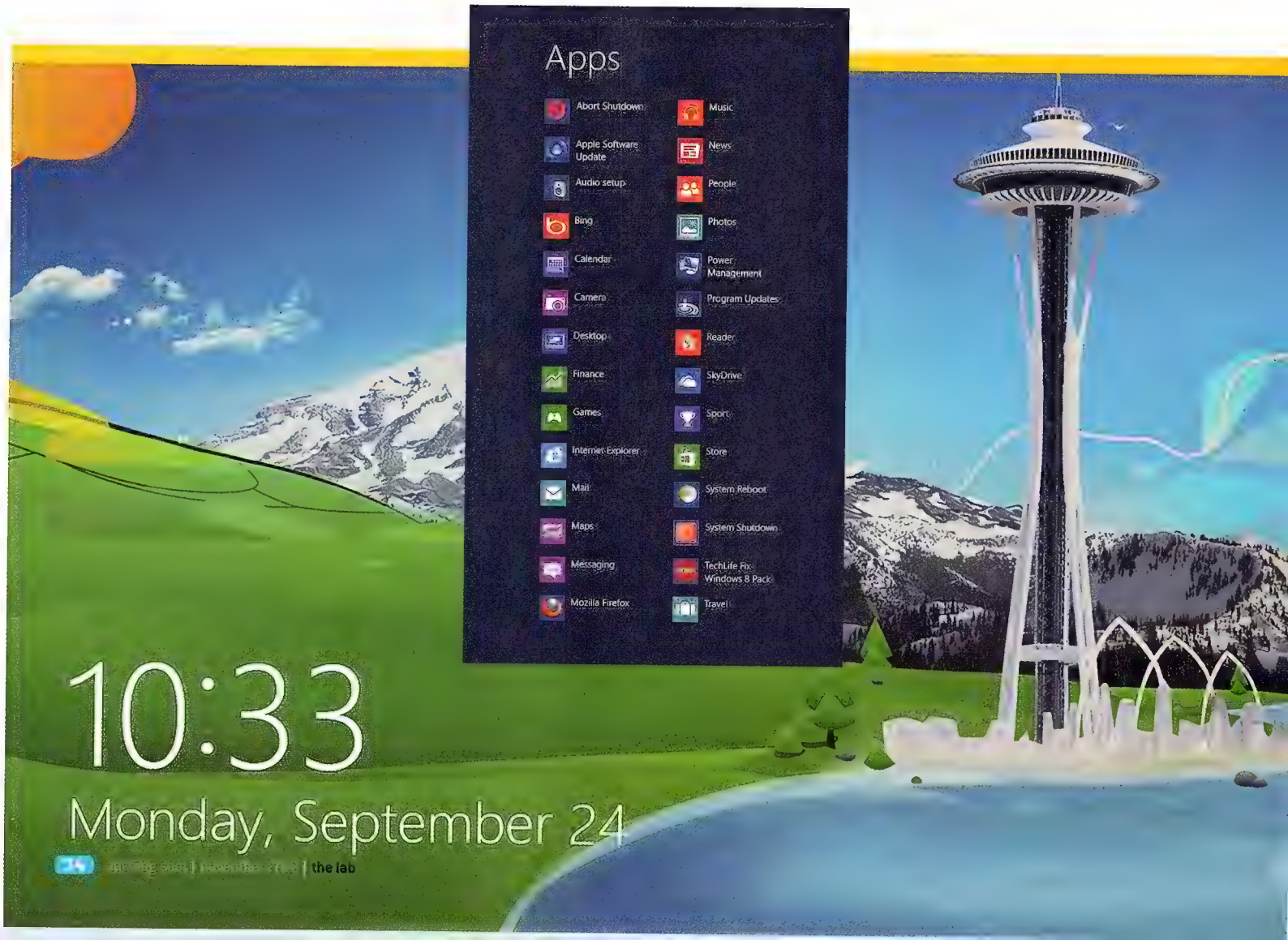
WINDOWS 8 YOUR WAY

There have been lots of Windows before, but this one is different. Windows 8 has an interface designed primarily for mobile devices rather than the PC. Is Microsoft out of its mind or is there method in the madness? In our special cover feature, *APC*'s Ashton Mills and Darren Yates look at Microsoft's motivation behind Widows 8, the good and bad parts, who should upgrade to it, how to set it up properly and how to get around its UI annoyances.



WINDOWS 8 IS HERE

On October 26, Microsoft's latest and most controversial OS yet goes on sale. Ashton Mills explains what's behind Windows 8.

Microsoft's next Windows has arrived. You've seen screenshots, likely played with the Developer, Consumer and Release previews and I bet the overriding thought you're having about Windows 8, whether you're a casual user or a hardcore techie, is: what was Microsoft thinking?

Which is a really good question to ask – and we'll delve into it in a moment – but it's also a bit of misdirection. The interface formerly known as Metro, which is what has been garnering so much attention, is the most visible change in Windows 8, although it's not the only one. To dismiss Windows 8 because of Metro is very much judging a book by its cover.

While we expect each new release of Windows to be better than the last – adding new features, stability, speed and a refinement of the desktop interface – Windows 8 presents the most radical change for Microsoft since Windows 95 and the introduction of the 'Start' menu. Which is an interesting place to start our discussion, since some 17 years later, the 'Start' menu is now no more.

So what *is* Microsoft thinking? Is it trying to alienate hundreds of millions of users and destroy the very foundation that made it successful in the first place: the paradigm of 'windows' itself, where each program is contained within its own window on the desktop?

The short answer is, well, yes. Microsoft is leaving behind the very feature that made Windows what it is today. It's not the least bit ironic that Windows 8, if used solely via Metro, uses no windows at all. Instead, Metro gives us tiles, programs run full-screen only and most importantly, is designed with touch interfaces in mind.

But Microsoft doesn't hate you. Instead, the company is trying to survive. If you look around you'll notice we no longer live in a desktop world: laptops, netbooks, smartphones and tablets are how more and more people live and work with technology every day. Portable devices like these offer a different way of computing and inevitably, if Microsoft wants to not only grab a piece of that pie, but stay relevant into the future, it absolutely has to develop with this market in mind.

Which is why Microsoft spent what we can only imagine is an awful lot of money designing its own interface for the touch generation, one that's new and unique and didn't copy the competition – yes, Microsoft innovated and rather well, too. Metro clearly isn't designed for standard desktop PCs, but it's ideal for tablets and smartphones – large, easily distinguished tiles that double as both an application launcher and information display. We actually quite like it.

And herein lies the rub: because Metro wasn't designed with keyboard and mouse desktop PCs in mind, what is Microsoft thinking by not only including it as the default interface, but hobbling the classic desktop to promote it? With the removal of the

'Start' menu – and making the lower-left corner bring up the Metro 'Start' screen instead – Metro isn't something you can easily avoid in Windows 8.

The problem for Microsoft is that it can't release two different versions of Windows (with and without Metro) because then it'll be creating two different ecosystems and never the twain shall meet. This then leads to something else that Microsoft is betting the bank on: the Windows Store.

Apple has shown us the way, that there are billions of dollars on offer in the app store ecosystem, and Microsoft wants in on that money train, especially as currently there's no Windows equivalent. Think about it: if you've got a Windows app store, would you really only sell to tablets and smartphone users when there are hundreds of millions of Windows desktops in the world?

So it's in Microsoft's interest to get everyone on board into the one ecosystem and thereby maximise the market for the Windows Store. And speaking personally, while I'd rather disable Metro as best I can and stick with the classic desktop, who am I to say that a killer Metro app won't appear down the track that I really want and suddenly I'll appreciate being able to switch to Metro to use it from time to time?

Which leads us to perhaps the biggest flaw with Windows 8: its Frankensteinian nature. Windows 8 doesn't follow in the footsteps of its forebears, as the last four versions have, forgoing the classic interface and dropping the 'Start' menu. But it also doesn't exist solely in its next evolution of Metro, by allowing the classic desktop to still be accessible. It has a foot in both worlds and masters neither.

So what other solution could there be for Microsoft? It can't not innovate and move with the times, otherwise it will die out, and it can't completely drop all attachments to the classic interface while the entire Windows ecosystem at this moment is based on it.

Ultimately, it's a fascinating barometer of our times. We're witnessing an evolutionary leap for the most popular, most recognised and most familiar desktop operating system the world has ever seen, as it tries to adjust to a future filled with mobile touch devices.

But as we noted above, Windows 8 is more than just Metro. So knowing what we do, and with Windows 8 now officially released, the next question becomes: how does it compare to Windows 7 and should you upgrade?

WHAT'S NEW WITH WINDOWS 8

After testing it endlessly through its long Preview program, Ashton Mills works out the good bits.

In Microsoft's favour, the development of Windows 8 has been the most open and engaging in the company's history. Not only were there three publicly downloadable and usable versions – the Developer Preview, Consumer Preview, and Release Preview – but the company spent a lot of time analysing user feedback to these releases and acting on what it learnt.

And due to the focus on the portable device space, which by nature involves hardware of sometimes limited power and capability, there has been a strong drive for optimising every part of Windows. That means from the kernel and memory management all the way up to the audio and video rendering layers and the display of the UI.

It's almost surprising that this latest release of Windows not only bundles more features and improved performance, but does so without adding to bloat, like previous versions.

For the last year we've been running a series in *APC* breaking down the innards of Windows 8 to see what's new, how it works and what you could expect for the final release. Now that it's here, we'll run down some of the most important changes and features.

SPEED

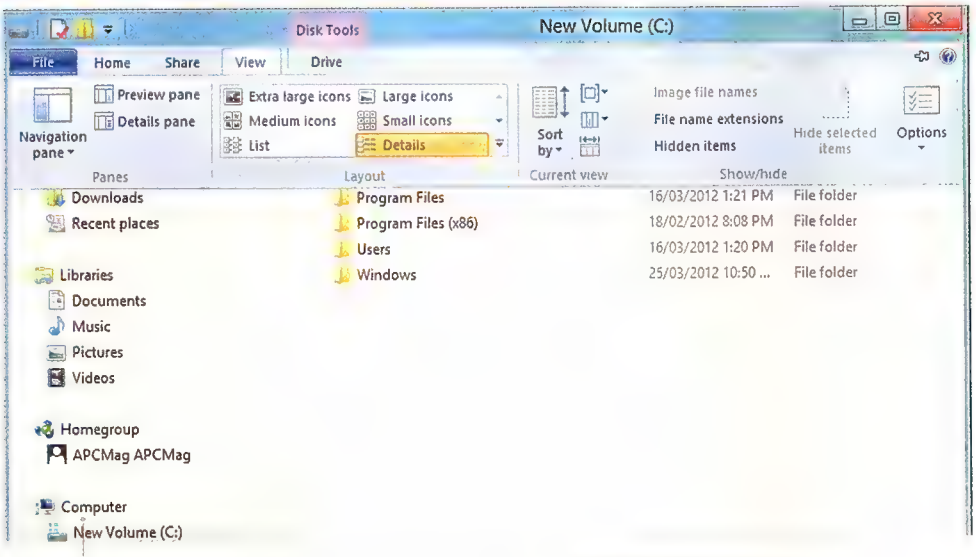
One of the earliest claims by Microsoft for Windows 8 was speed, touting a slicker user experience and lightning-fast startup and shutdown times. It doesn't disappoint – Windows 8 is roughly twice as fast as Windows 7 for booting on any given system and when paired with an SSD, it can boot to the desktop in under 10 seconds.

An emphasis on efficient memory usage (especially in regard to Metro apps, which can be suspended and unloaded from memory on demand) means more free memory for programs and less pressure on page files. Even with Metro loaded, which you'd expect to take up more memory than the classic desktop alone, Windows 8's base footprint is smaller than Windows 7's by some 200MB.

With the need to squeeze every ounce of performance out of lower-end hardware of the type found in tablets, the rendering of text, geometry and images (basically, all the components required to display Metro) have been greatly accelerated to provide a slick, smooth experience. This translates to a snappier, faster classic desktop, too.

POWER EFFICIENCY

Windows 8 will suspend Metro and desktop programs when a device enters sleep mode, allowing the CPU to save power, although it provides a new 'Connected Standby' feature to allow certain Metro apps, such as email, to receive updates even while a device is



Explorer now sports the Ribbon made popular (or unpopular) by Microsoft Office 2010. After feedback from the Developer Preview, the Ribbon defaults to minimised.

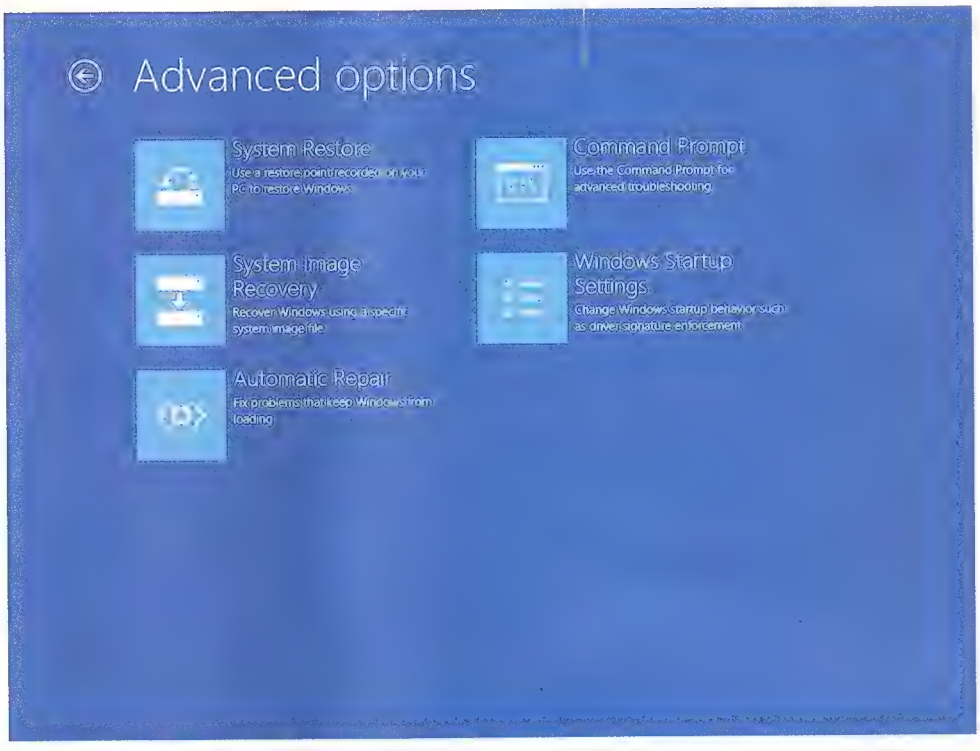
Let your fingers do the passwording. 'Picture Password' lets you draw on a picture as a method of authentication. Yes, we've used this picture before – what can we say? Steve Ballmer's a charmer!

The new clean, graphical recovery tools are considerably more user-friendly than the old ASCII-based screens we've had for decades now.

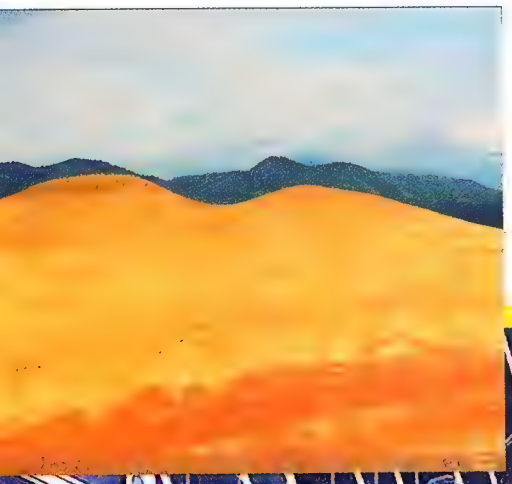
technically asleep. Microsoft also identified that one of the biggest power drains is multimedia playback and as such, where possible Windows 8 will offload video processing to the GPU, which is usually more efficient, thus reducing CPU usage and power. This is bundled with a strict framework on which programs and apps can run background tasks, and which can instead be suspended, ensuring power isn't wasted by unnecessary background processing.

ENHANCED EXPLORER

While Metro tries to steal the limelight, Explorer is still the essential caretaker of the classic desktop and it's received a ton of loving in Windows 8. Perhaps the most prominent changes are the new Task Manager, which encompasses a whole new and easier way to view and manage running processes; the new file copy dialogue, which combines multiple



The classic desktop is still there, but is now launched as an 'app' from the Metro 'Start' screen. It functions much the same, though with some differences, like the absence of the 'Start' menu.



transfers into a single window and allows you to pause any transfer in progress, even over a network; and a new Office-2010 inspired Ribbon that makes it easier to access the full functionality of Explorer as a file manager. Thankfully, though, Microsoft listened to feedback and the Ribbon is hidden by default to ensure a clean look and maximum screen real estate for managing files.

DEVICE SUPPORT

Obviously touchscreens feature heavily, but there are a range of other upgrades as well: USB 3.0 support is now built in, SSDs are properly detected and optimised for (enabling TRIM, disabling disk write-intensive services like the defragmenter) and multiple-monitor management finally sees some attention – the taskbar can be properly extended across multiple desktops and the classic desktop, and Metro can be run side by side on different monitors. Finally, of course, Windows 8 is the first version of Windows to support ARM architecture, popular with tablets. However, it's worth noting that this is a slightly different ecosystem – x86 apps from the Windows Store can't run on ARM and vice versa.

IMPROVED RECOVERY OPTIONS

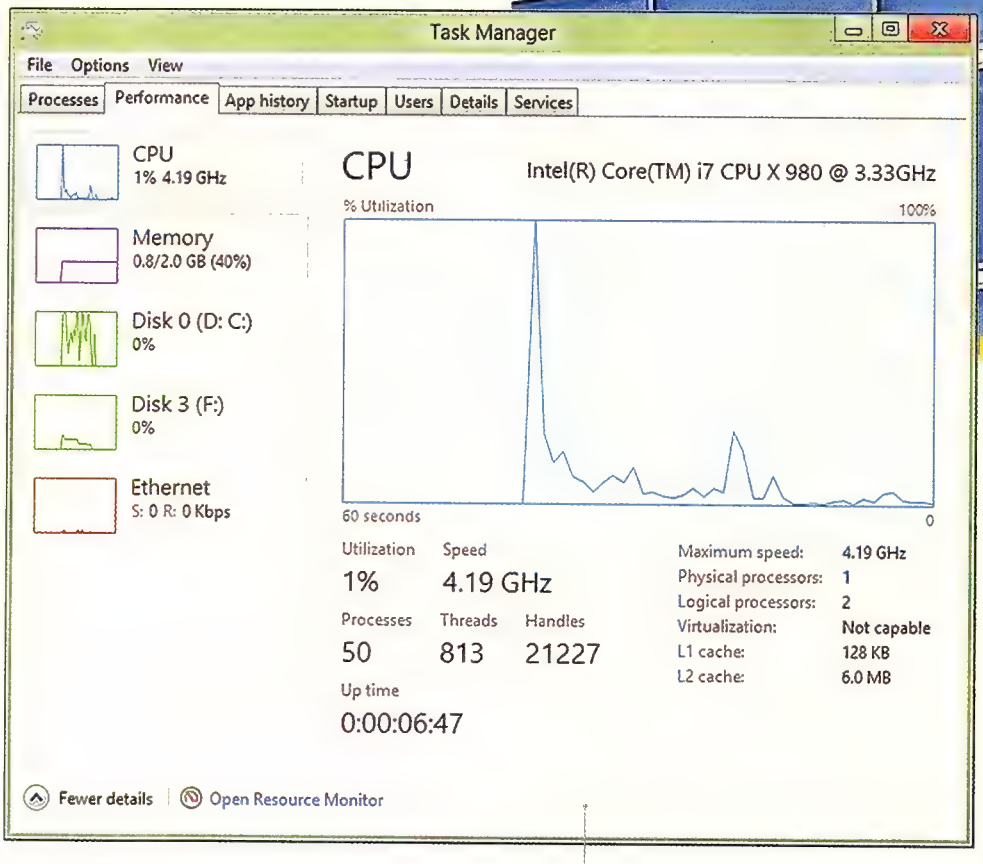
Windows has long been maligned for its BSOD, sometimes fairly, but there's always the problem of how to recover, especially if a crash renders a machine unbootable. Windows 8 provides a range of recovery and restore options, both from within Windows 8 itself and the new graphical boot menu. You can easily Refresh your PC, keeping your personal data but restoring Windows to a pristine state; or Reset it to factory default, wiping everything and resetting Windows back to a clean install. Classic troubleshooting options are still present, such as changing startup settings or dropping to a command prompt, but the new recovery dialogue also makes it easy to run an automated repair, roll back to a restore point or reload Windows from a backup image.

SECURITY

Ever conscious about Windows' profile when it comes to security, Windows 8 comes with a new SmartScreen service that actively checks programs against a known list of bad apples, as well as filtering out phishing sites while browsing, if using IE. It's different from virus protection in the sense that it tries to prevent malware getting on the system in the first place, rather than detecting and removing it once it has.

The latter, of course, is a service now provided by the updated Windows Defender in Windows 8; this new version is technically equivalent to Microsoft Security Essentials, providing full antivirus and antimalware functionality. Realistically, Microsoft has finally merged these two services and Windows Defender is Security Essentials in all but name.

Finally, one of the more significant changes is what Microsoft calls Secure Boot and works in conjunction with UEFI-based motherboards. Secure Boot protects the boot path all the way from firmware to Windows initialisation, theoretically preventing boot block and driver-based exploits from taking hold.



The Task Manager is one of the more overhauled components in Windows 8 and it's simply a joy to use.

NEW TECHNOLOGIES

What release of Windows would be complete without a few new toys to play with? Some of the more notable inclusions with Windows 8 are Storage Spaces, File History and cloud integration. The latter ties your user account – which you must create when you install Windows 8 – with a Microsoft Live ID that allows you to sync settings, programs and other personal data between different Windows 8 devices. This is then coupled with Microsoft's SkyDrive cloud storage service to provide a reasonably solid integration of the cloud for Windows 8.

However, the two stars of the show are Storage Spaces and File History. The former allows you to amalgamate different storage devices (including external USB drives) of different sizes into one pooled storage framework, with redundancy and the ability to expand storage by adding and removing drives at will. File History is effectively Time Machine for Windows, which provides an easy-to-use backup engine that can work with external drives or network targets, and has the ability to look through and restore different versions of files backed up over time.

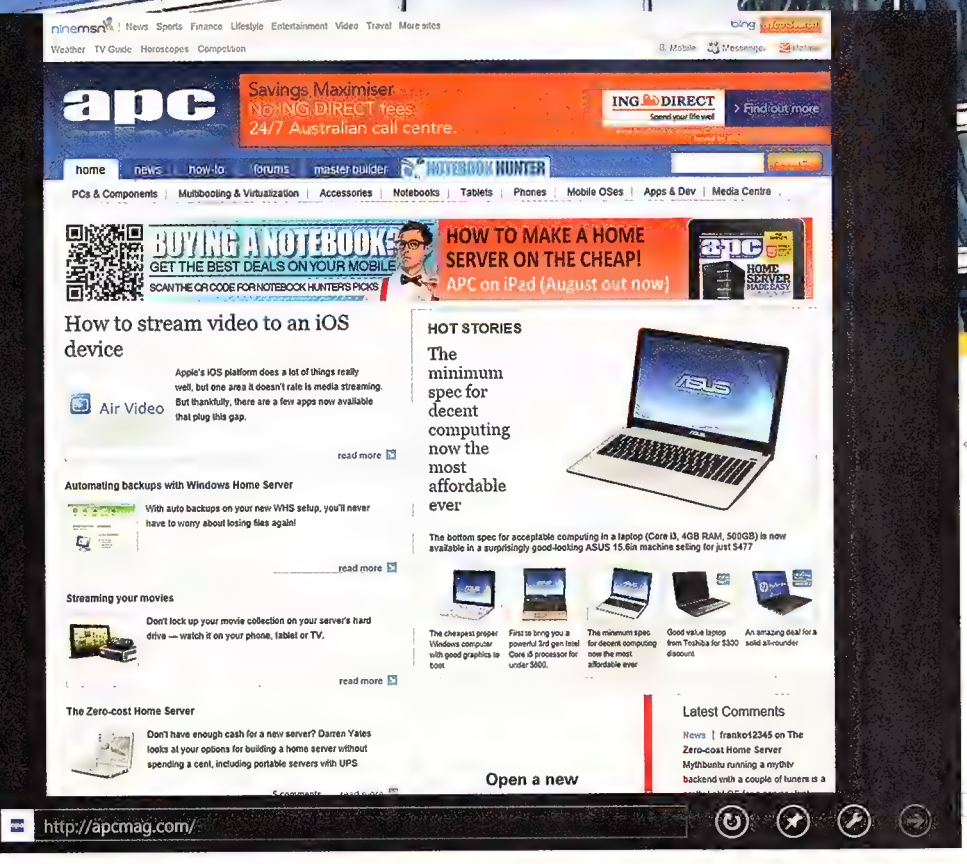
WINDOWS STORE

The proverbial and oh-so-profitable icing on the cake for Microsoft is the new Windows Store, providing the official Microsoft experience of the purchase-and-download paradigm that Apple's App Store has shown us so well. Microsoft is pushing hard for developers to write programs that will sell via the Store, but it's worth noting that *only* Metro apps can be purchased and downloaded from it. For classic desktop users, the Store doesn't hold much interest, though, given the planned ubiquity of Windows 8 across all platform devices including tablets, laptops, smartphones and, of course, the desktop. Like it or not this will ultimately cement the Store and Metro apps as the de facto platform for Windows programs.

PRICE

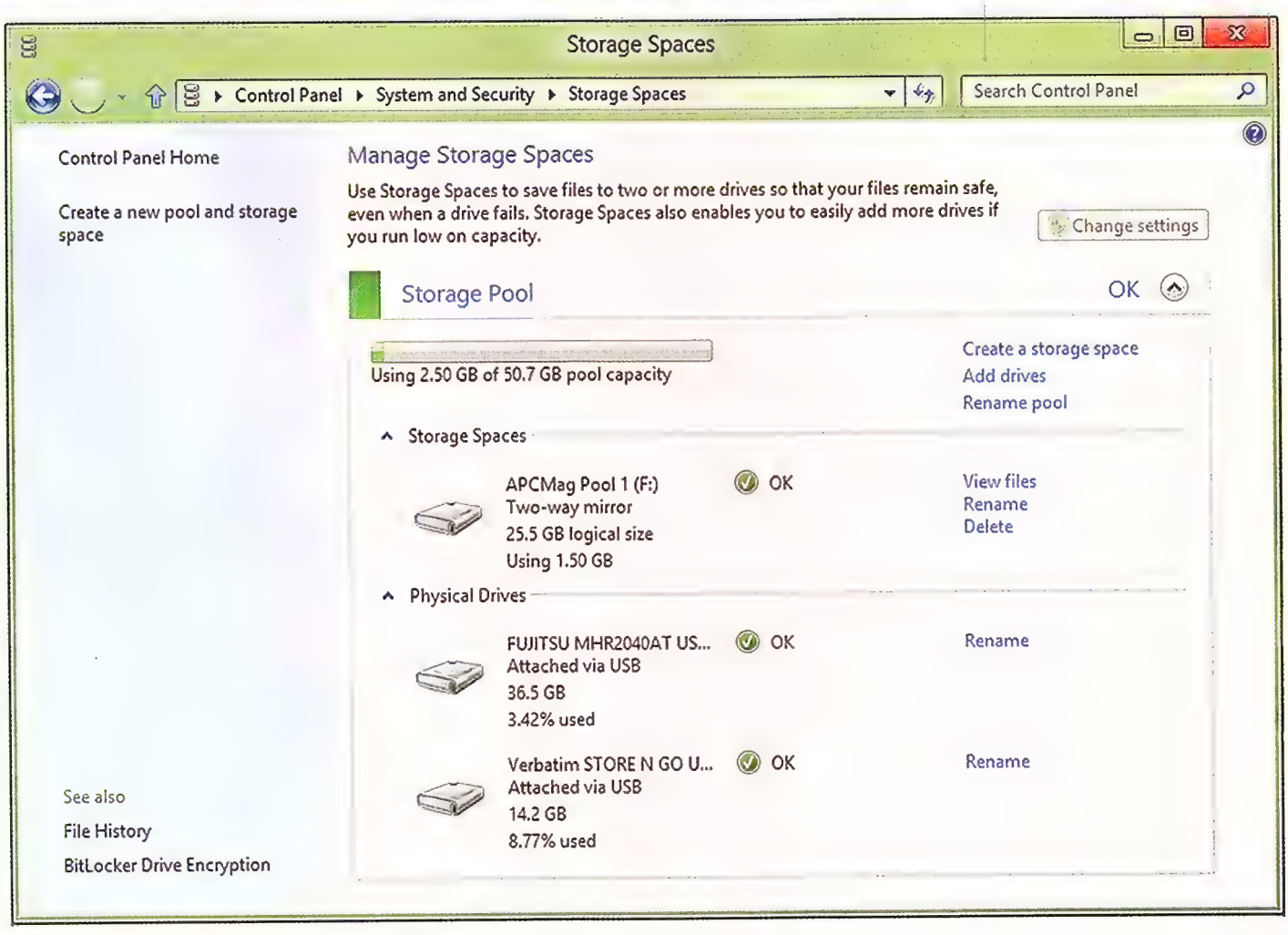
There is such a discrepancy here we think it bears mentioning: Windows 7 costs hundreds of dollars, even for the lower-cost Upgrade version. The cheapest edition from Microsoft Australia is $199 for Windows 7 Home Premium. Windows 8? You can upgrade to Windows 8 Pro for $39. This is an exceedingly smart thing for Microsoft to do – it's in the company's interest to get adoption up as widespread and as fast as possible to make the Windows Store a viable and profitable platform.

These are some compelling changes and advantages for the new Windows 8, but it's not the whole story. Some of the changes Windows 8 brings may not be to everyone's liking and we'd remiss to not cover the disadvantages should you choose to upgrade.



IE10 comes standard with Windows 8 and powers both the Metro desktop and the Metro IE browser. It's a different beast from the traditional IE, however, and no longer supports plug-ins or add-ons of any kind.

Storage Spaces allow you to mix and match all manner of media from hard drives to USB keys and have them appear as a single storage device to Windows.



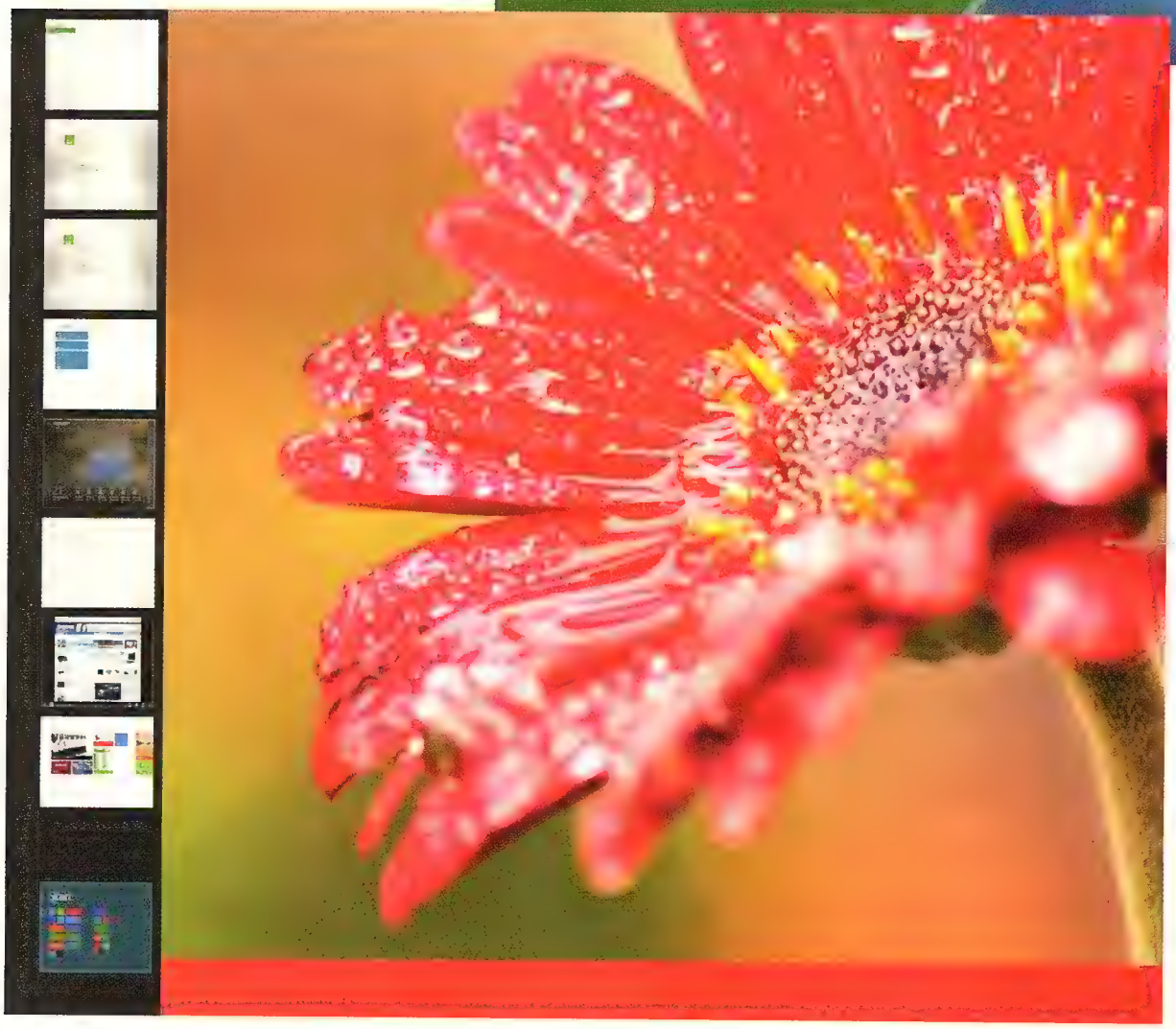
ANNOYANCES

METRO

Windows 8's biggest drawcard is also its Achilles' heel – no matter how Microsoft spins it, Metro isn't designed for and doesn't work well for desktop PCs. Unless you use some hacks to get around it, you're going to be faced with Metro every time you boot your PC. And even if you *do* work around it (see page 52 for our guide on how to do this), you're still left with a slightly crippled desktop that looks much the same, but lacks simple interface paradigms you're used to, like the 'Start' menu. This forces you to use functions like Metro search to find and launch programs, which only highlights another major problem with Windows 8 (see 'Lack of consistency', below). And even with hacks, Metro is still there – the corners of your screen trigger the Charm bar or the Metro app switcher – you can never totally escape it. For us it seems counterintuitive that anyone should need to fight the user interface in order to use their PC.

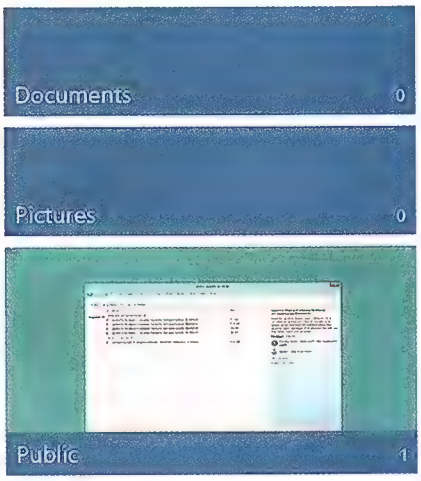
LACK OF CONSISTENCY

With a foot in both camps, you'll likely end up switching between Metro and the classic desktop when using your PC. This isn't just a function of running programs, with Metro and classic Windows programs running on two different desktops, but general use as well.

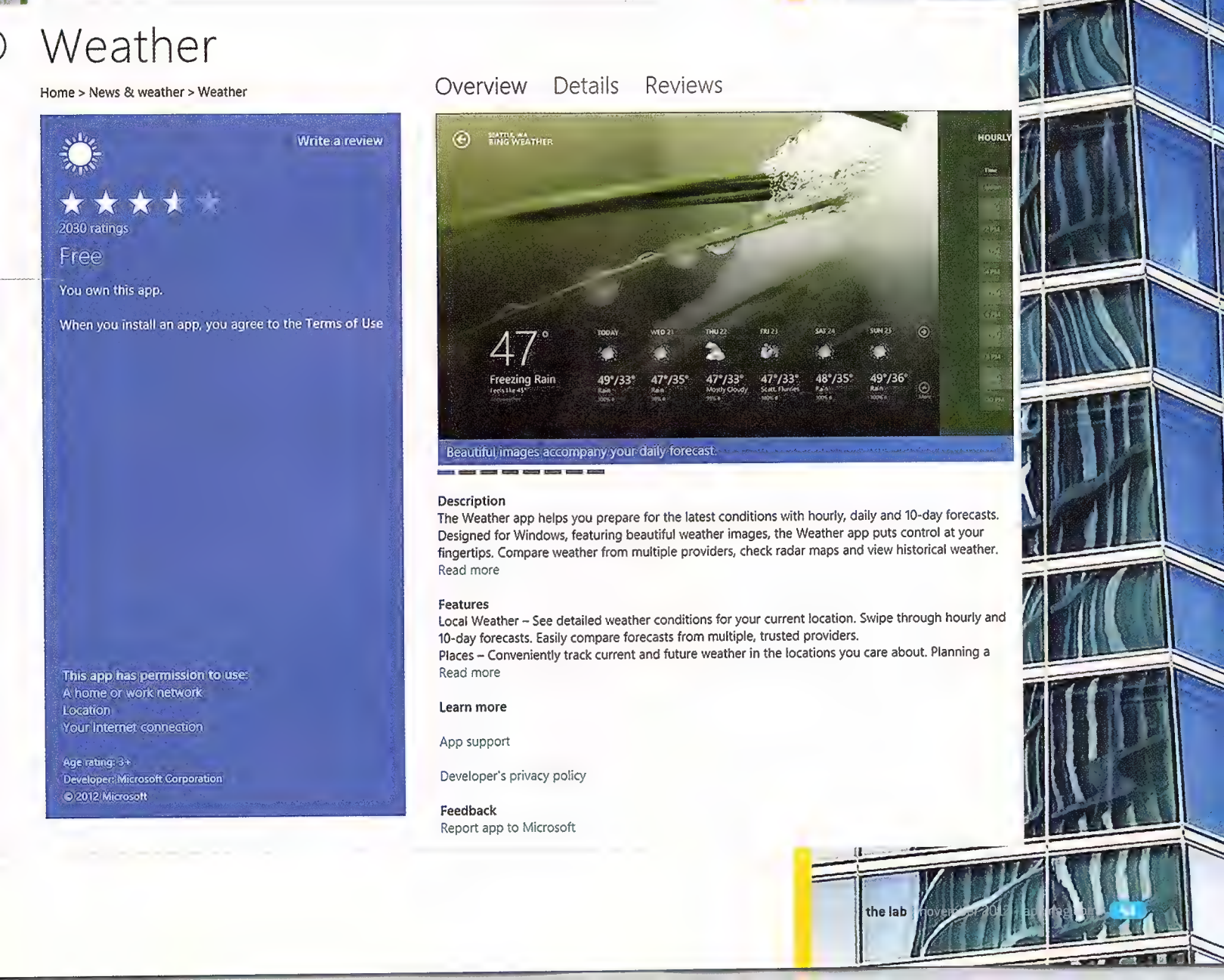


The sincerest form of flattery, Microsoft has learnt from Apple and has launched its own app store called the Windows Store. All apps on the store during the Consumer Preview period are free.

Metro apps aren't closed, merely paused in the background while still being swapped out to free up memory as necessary.



If you create a Microsoft account, you get your own personal cloud storage with SkyDrive, which is also integrated into the classic desktop with Explorer.



Task switching in Metro only shows Metro apps, but from the desktop it shows all of the programs on the system. There are two different 'Control Panels': one for Metro and one for the classic desktop, with some settings duplicated between both and some unique to both. There are three update mechanisms: one in Metro, one in the classic desktop and one in the Windows Store (why the Metro one doesn't encompass this isn't clear). This isn't something that can be avoided – even if you like Metro and plan to use it, all your current programs don't work with it. Even if Metro equivalents appear, it's unlikely (or even impractical) that you'll find them for everything you use. In other words, you'll be switching between two completely different-looking and -operating interfaces every day just to be productive on your PC.

It would be ideal if Microsoft could let you live in a single, consistent desktop, although as we discussed, that doesn't benefit Microsoft if Metro (and especially the Windows Store) is nowhere to be seen. The fact that Metro is forced on desktop users is very clearly Microsoft putting its interests above yours as a customer and a user.

UEFI LOCKDOWN

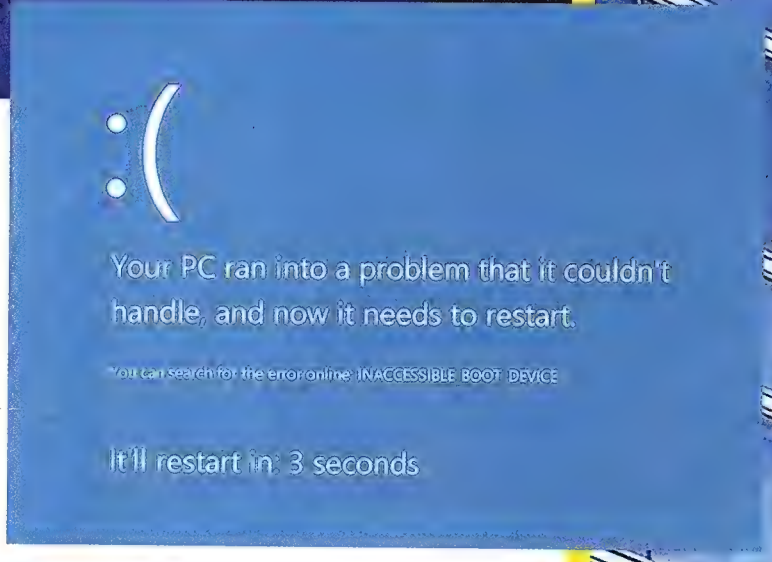
UEFI is the Unified Extensible Firmware Interface, successor to the aging BIOS, that most new PCs you buy today will have. Perhaps unfairly, Microsoft has been maligned over its use of tying UEFI into its secure booting process that tries to prevent the OS from being hijacked. The technology is actually designed by Intel, Microsoft is just taking advantage of it.

That said, it does pose serious issues for users wanting to install anything else on their system alongside Windows 8, such as Linux. As Linux is open source and comes in many varieties and flavours, there are no signed keys that shipping UEFI PCs will recognise, thereby preventing Linux from booting. It's worth noting that this is only an issue for dual-booting. The secure boot function tied into UEFI is only activated if Windows 8 is installed – Linux still works fine on its own with UEFI PCs. However, it means that until a solution is found (Red Hat and Canonical are looking into it, but there's no telling how long this will take) and you regularly dual-boot Windows and Linux, it would be best to avoid Windows 8.

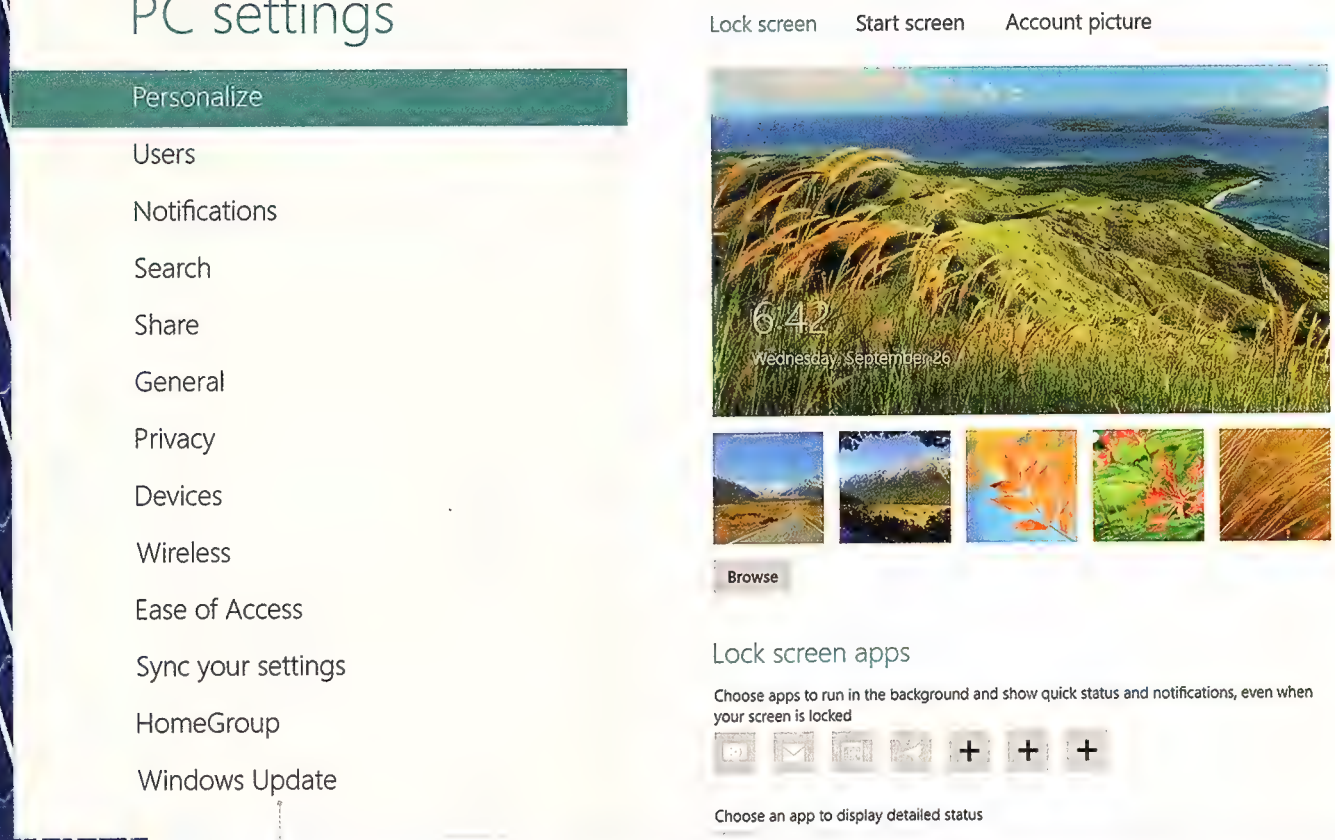
NOT ESSENTIAL

We've said this before, but it really bears thinking about before you're blinded by all the bling in Windows 8: it doesn't actually do anything you're not already doing with Windows 7. There's no compelling need to upgrade to Windows 8 – all the above features aren't going to change how productive you are right now with Windows 7 and may actually impede you in regard to Metro getting in the way. The only saving grace Windows 8 has is its price – if Windows 8 was priced anywhere near what Windows 7 was on release, it'd be easy to say upgrading would be a waste of money. But at $39, it's almost chump change and comes down to balancing the pros and cons you've read about in these pages.

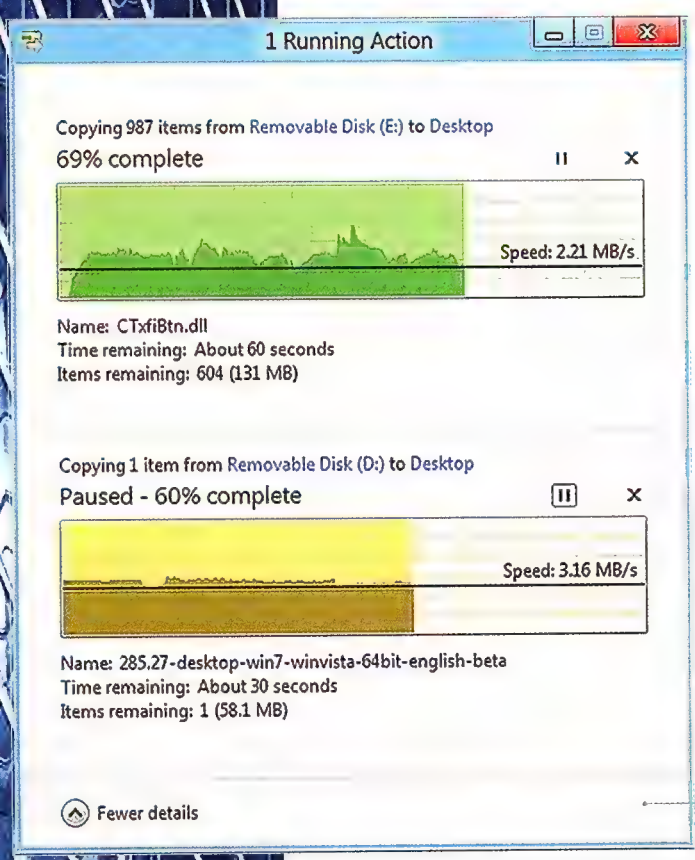
The Charm bar on the right of the screen is the new system-wide and contextual application-based 'tools' menu.



Even the venerable BSOD screen sees an update in Windows 8. Here's hoping you never get to see it, though.



This is the 'Control Panel' in Metro. Below is the 'Control Panel' in the classic Windows 8 desktop.



It's small touches like the new copy dialogue that makes Windows 8 feel polished and modern.

IS WINDOWS 8 FOR YOU?

Everyone is different, but here's *APC*'s take on who we think will or won't benefit from upgrading to Windows 8.

STUDENTS

While Windows 8 is cheap, it doesn't actually do anything that you can't already do with Windows 7. The exception is perhaps battery life performance on mobile devices such as laptops, which could be beneficial. That said, you might as well wait until your next desktop/laptop upgrade, where Windows 8 will come bundled as part of the package.

GAMERS

While Windows 8 initially appeared to show a small slowdown compared to Windows 7 in gaming benchmarks back at the Developer Preview, this seems to have been ironed out by the release of Windows 8. With all the major GPU manufacturers having released Windows 8-specific drivers, it's fair to say that Windows 8 is as capable a gaming platform as Windows 7 was. In some ways, thanks to all the optimising under the bonnet, Windows 8 may even be a better platform for gaming, just as long as you don't let Metro get in your way.

ENTHUSIASTS

By nature, overclockers, system builders and Windows enthusiasts are going to want the latest and greatest, and it doesn't matter what you read here or elsewhere. If this is you, then your mind is already made up. Maybe keep a dual-boot system with Windows 7 as a backup, however, and good luck!

FAMILY

What about the 'non-geeks' in your family? Will Windows 8 appeal? Well, with a few quick tests on our own guinea pigs (aka partners and siblings), the initial reaction wasn't good. Metro is such an abject departure from the classic Windows desktop they're used to that it was confusing and frustrating. Your mileage may vary depending on the techno-literacy of family members, but unless you feel they need something Windows 8 brings, it's probably best to save your own sanity as de facto tech support and not upgrade them.

SMALL OFFICE

Even though Windows 8 isn't an expensive upgrade, in terms of productivity (email, browsing, Office) it doesn't offer anything you and your staff can't already do with Windows 7. Depending on the size of your business, it likely isn't worth the effort in retraining, either.

MOBILE PROFESSIONALS

Here's one area where we think Windows 8 could shine. The power saving, speed enhancements and smaller memory footprint make it an attractive upgrade for laptops, while its integration with cloud services to sync content and user settings would make it easier for road warriors to keep phones, tablets and laptops up to date.

BUSINESS/ENTERPRISE

Bespoke software is always a determining factor here, but if there are no special software requirements, there seems little incentive to upgrade to Windows 8. As a productivity platform it doesn't offer anything Windows 7 doesn't already do, Metro isn't anywhere near apt for productivity applications like Office on the desktop, and the costs of retraining (with or without Metro, given the changes to the classic desktop) make it even less attractive. Given that some businesses still use XP, we don't expect Windows 8 to make inroads for big business for years to come, if at all.

DEVELOPERS

Microsoft is pushing hard for Windows 8 and Metro, so its latest Visual Studio bundle focuses on helping developers build apps for the Windows Store (right down to integrating the first steps of publishing into Visual Studio itself). If you plan on building Metro apps as a business model, then it's better to dive in sooner rather than later and get a handle on Microsoft's new ecosystem.

With the major GPU manufacturers having released Windows 8-specific drivers, Windows 8 is as capable a gaming platform as Windows 7 was.

SETTING UP WINDOWS 8

So you've got a new Windows 8 PC or dived into an upgrade purchase. Ashton Mills guides you through setting up Windows 8 and finding your way around Metro.

FIRST STEPS

While Windows 8 is still *mostly* the Windows operating system you know and love, there are a few things different about setting up a new Windows 8 install.

WINDOWS UPDATE

With the global release of Windows 8, Microsoft is going to be lambasted with feedback and bugs, so it's always best to check for updates, especially with a new install. In Windows 8 you have two options for doing so:

METRO

Bring up the Charm bar (hover the mouse in top-right or bottom-right corner of the screen) and go to 'Settings > Change PC Settings > Windows Update'.

CLASSIC DESKTOP

Right-click in the bottom-left corner (when the 'Start' screen shortcut appears) and go to 'Control Panel > System & Security > Windows Update'.

A number of the bundled Microsoft Metro apps will inevitably need updating and Windows Update doesn't handle these. To update Metro apps you need to click the 'Windows Store' tile first and then click on the 'Updates' text if any are pending. There doesn't appear any way to force Windows 8 to check for updates apart from launching the Windows Store.

DRIVERS

Installing the latest drivers is an essential step for a new Windows install and Windows 8 is no different. Well, for the most part – at the time of release, not all device manufacturers have Windows 8-specific drivers. However in many cases, they also aren't required: the Windows 7 drivers will work fine, though there are some caveats. Here's our advice regarding drivers.

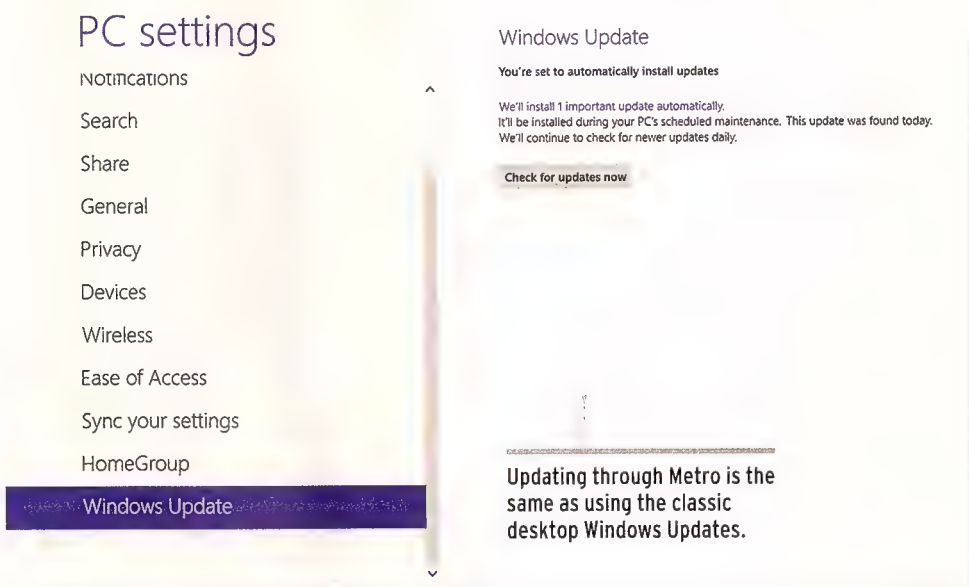
GRAPHICS

Install the latest Nvidia, AMD or Intel GPU drivers designed specifically for Windows 8.

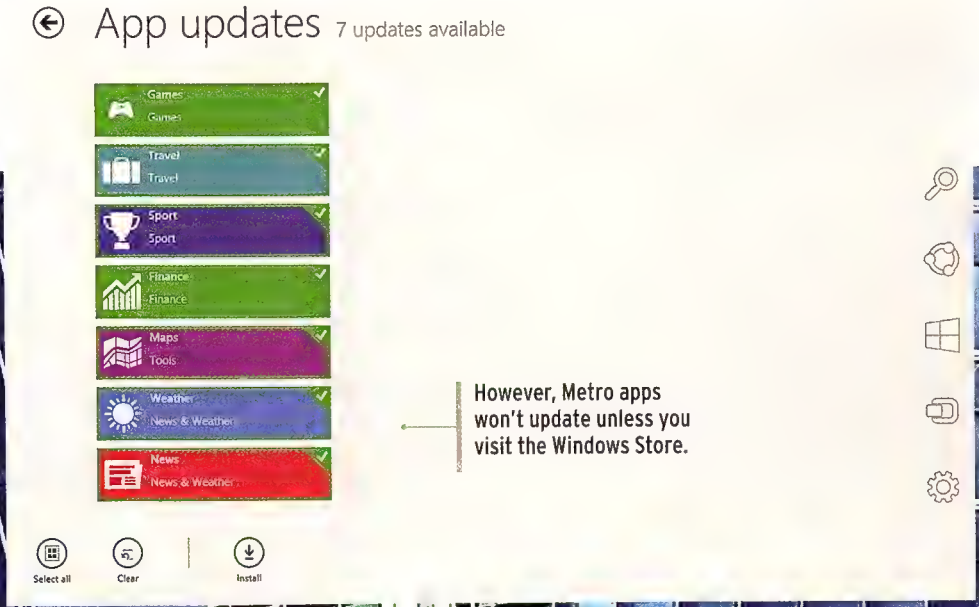
There have been enough changes under the bonnet that you need specific Windows 8 drivers for the best performance and stability.

SOUND

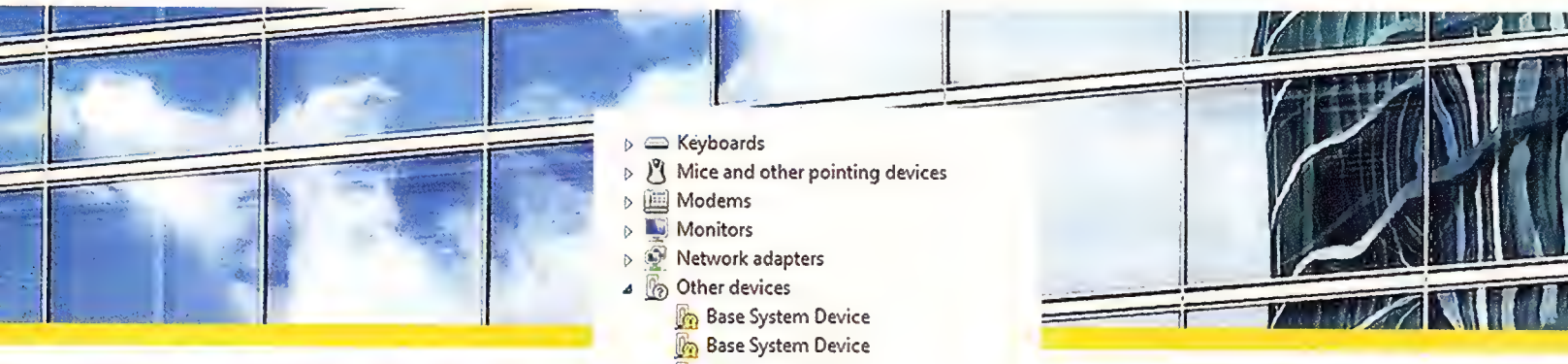
Onboard sound (such as Realtek solutions) should work fine with Windows 8, but it's still worth installing the management software from the manufacturer's web site to get extra features like DSP or surround sound settings.



Updating through Metro is the same as using the classic desktop Windows Updates.



However, Metro apps won't update unless you visit the Windows Store.



Windows 8 doesn't recognise this hardware in our Lenovo SL500 laptop. Unfortunately, this is an example of driver support not currently available and may never be available.

This goes double for dedicated sound cards, such as those by Creative.

CHIPSET
Some motherboard hardware, especially on devices such as laptops, may not come with support in Windows 8. Where possible, install the latest drivers from the manufacturer to ensure these work correctly, but in some cases there may not be compatible drivers available.

PERIPHERALS
Windows 8 should have you covered for most devices, but some specific hardware – such webcams, biometric scanners or specialised input devices – may need their full official drivers to work fully.

For those devices for which you can't find native Windows 8 drivers, again, in many cases the current Windows 7 ones will work. However, the install may baulk, saying it can't find a supported operating system (since it's looking for Windows 7). Simply right-click the setup file for the drivers in classic desktop mode, click on the 'Compatibility' tab, tick to run in compatibility mode and select Windows 7 as the platform.

It would be worth setting a System Restore point for this before you do so, just in case.

FILE HISTORY

Now is the time to take advantage of one of Windows 8's new features. Set up File History to create an automatic backup so that you don't lose all that important data you never plan to back up. It's fire-and-forget now, so you've got no excuse!

METRO
From the Charm bar, click 'Search' and type in File . On the resulting screen, click 'Settings' under the search field and then 'File History' in the left pane.

CLASSIC DESKTOP
Right-click in the bottom-left corner and select 'Control Panel > File History'.

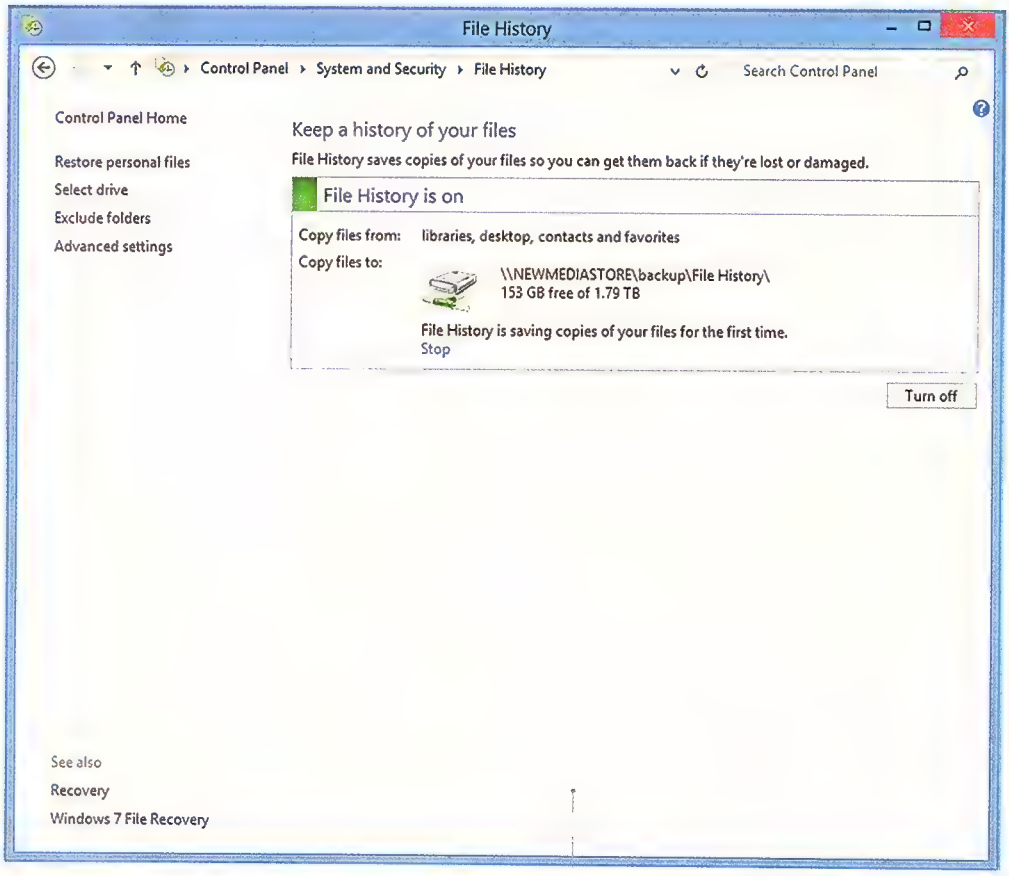
You can use an external USB drive or a network location (such as a NAS) as your backup target. If using a network target, you'll note the small text 'Use network location' in the warning box if no USB drive is plugged in. Simply browse to the network target where you want File History files stored.

With a USB drive connected or a network target selected, click 'Turn On to start File History'. It will make an initial backup and you're done! To browse files in the backup, click 'Restore personal files' in the left pane. It's also worth clicking 'Advanced settings' and changing the 'Keep saved versions' option from 'Forever' to 'Until space is needed'. This way if and when your storage target runs out of space, it will automatically start culling from the oldest backup versions.

Finally, note that File History backs up libraries, contacts, favourites and files on your desktop. Unfortunately, these are fixed locations, so if you want to use it to back up files elsewhere on your system, you need to make a new library or copy the files to one of those locations.

CREATE A BACKUP

Before you get onto tweaks and installing applications, now is a good time to create a backup image of your clean Windows 8 install, just in case something should go wrong down the track. Here's how to do it easily.



Windows 8's new File History makes it a snap to back up your important data. Just choose a USB drive or network location, and turn it on.

WIN A 3D PRINTER

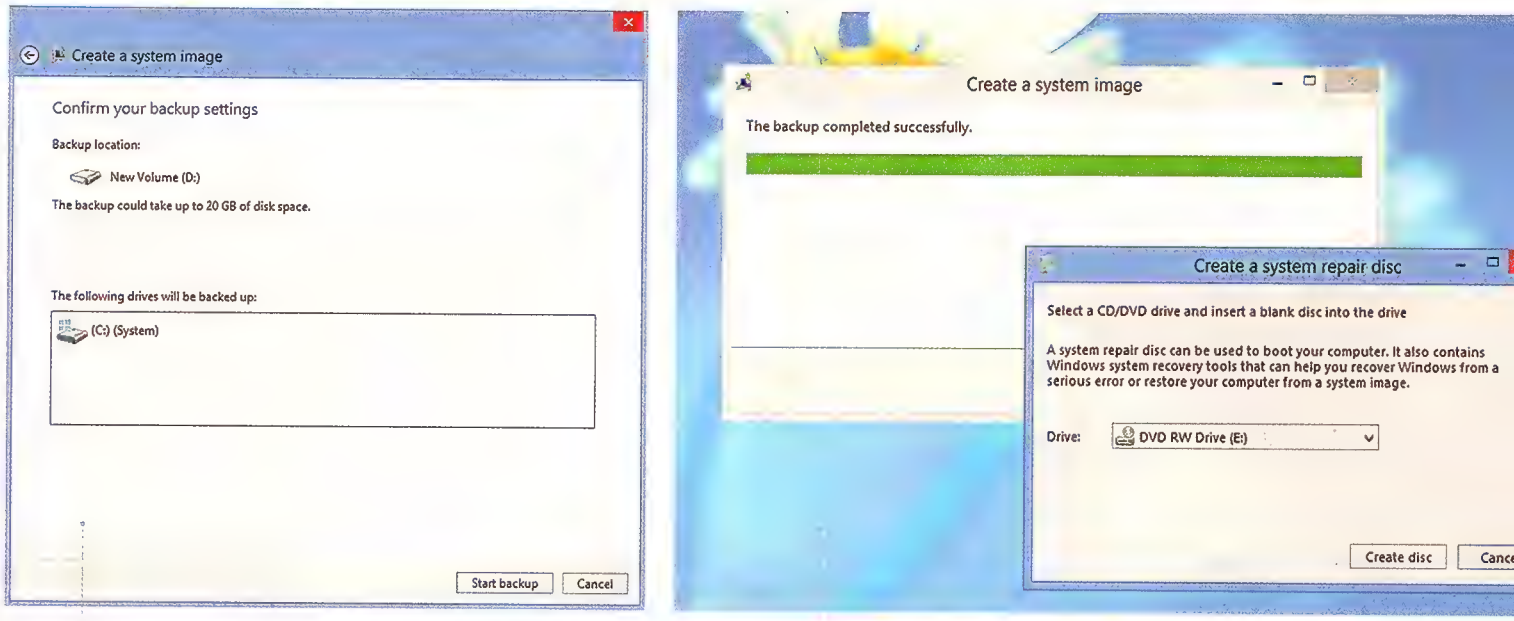
The UP Plus 3D printer pictured above has to be one of the most amazing prizes ever given away in a magazine. With an RRP of $1,918, the UP Plus 3D printer has the finest print quality for making 3D objects and is easy to use.

It will completely change your world and is now available in one powerful package. If you don't believe how amazing these things are, check our 3D printer coverage in the November issue of *APC*'s sister mag, *TechLife*.

For your chance to win the UP Plus 3D printer, 'Like' *TechLife*'s Facebook page at **facebook.com/techlifer** and send us your idea for the most interesting product you'd like to print with it.

We think we're only just scratching the surface of what's possible with a 3D printer and the best idea will win the UP Plus 3D printer.

Use The *TechLife* Facebook page's 'Message' button just under the bottom-right of the main Timeline image to send us the entry. We'll stop accepting entries at midnight on November 6 (terms and conditions of the competition are on the Facebook page).



Once you've finished setting up your new Windows 8 install, it's a good idea to create a full system image that you can roll back to if you ever need to recover your personalised Windows 8.

METRO
From the Charm bar, click 'Search' and type in file recovery . Then, click 'Settings' under the search field and then launch 'Windows 7 File Recovery'.

CLASSIC DESKTOP
Right-click in the bottom-left corner and select 'Control Panel'. In the search bar, type File and launch 'Windows 7 File Recovery' (yes, Microsoft appears to have buried this function in 'Control Panel' – it doesn't seem to belong in any category).

Once launched, you'll be presented with a choice of backup targets where a whole system image will be created – it can stored on a local hard drive, on DVD recordable discs (note you may need a *lot* of them) or a network target. By default, it will make an image of your C: drive, but depending on your system configuration, you may be able to image other drives as well.

Once that's been completed, you'll have a restorable image of your pristine and freshly set up Windows 8 install. You'll also be prompted to make a system repair disc. This is a good idea and you can use a portable USB key to do so, plus you can also initiate a system image recovery directly from the troubleshooting section of the new Windows 8 boot manager.

How big is a fresh Windows 8 install system image? Approximately 11GB.

NAVIGATING WINDOWS 8

So you've got this Metro thing in front of you. Looks kinda pretty, but where has everything gone? How do you use this thing? Here's our quick guide to surviving Metro and making it work for you.

PANIC BUTTON
First up, notice the 'Desktop' tile. If Metro is getting to you and you want to feel that warm comfortable glow of the classic Windows desktop, slam this button and you'll feel right at home (well mostly, now it's sans the 'Start' menu. See page 52 for how to fix this).

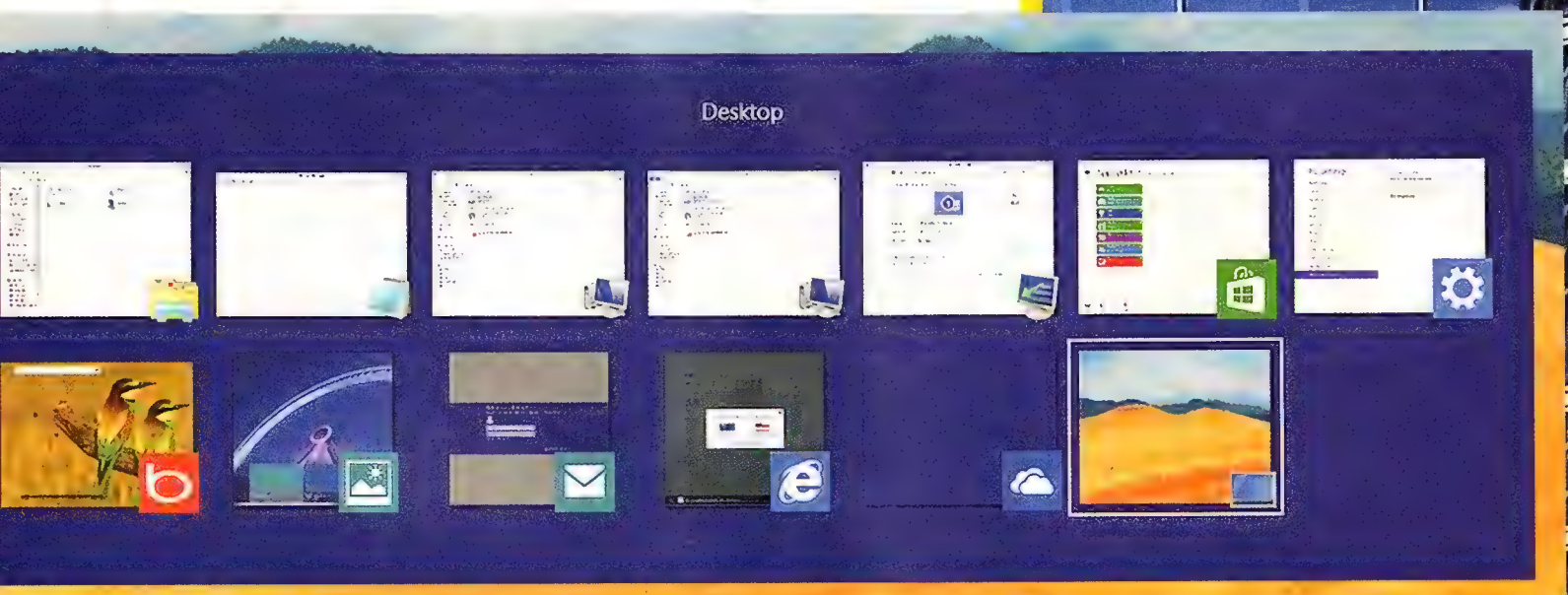
CHECK THOSE CORNERS!
Perhaps this is what Sgt Apone meant in the movie *Aliens* when he led his team into a completely alien domain, not unlike Metro... "Check those corners!" It's good advice, too: the corners are your marionette strings for Metro. Move the mouse to the top-right or bottom-right to bring up the Charm bar, which gives access to 'Search', 'Sharing' and app-context 'Settings'. Move to the top-left to bring up the task switcher (then move the mouse down to see the full list of running apps) and move to the bottom-left to bring up the last-used app from the 'Start' screen or return to the 'Start' screen from any app.

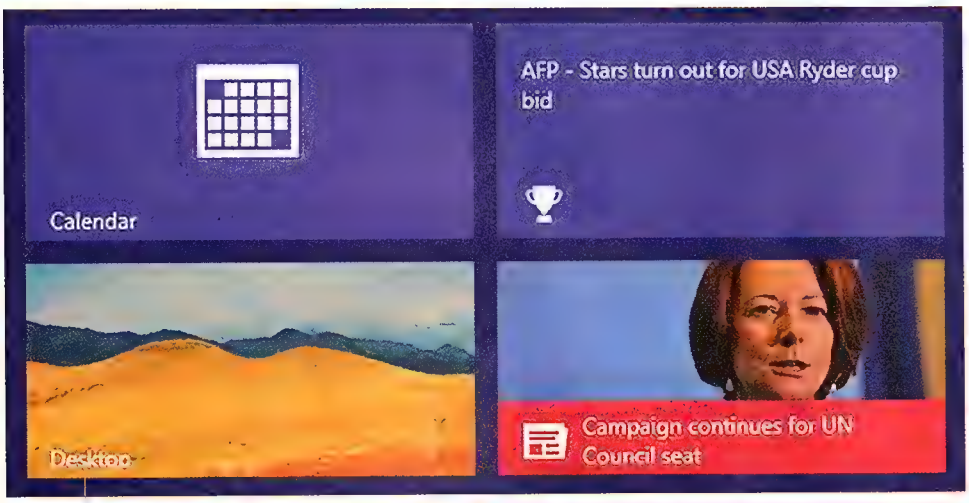
MANAGE TILES
You can rearrange the Metro 'Start' screen by simply left-click-dragging tiles around. To change their size, right-click a tile and in the settings that appear at the bottom, choose to make them smaller or larger. Note that this is where you can uninstall an app, unpin it from the 'Start' screen or disable its live tile updates.

SCROLLING
If an app scrolls off your screen (this applies to the 'Start' screen as well), you can drag the scrollbar if it's present, scroll the mouse wheel or use the Page Up and Page Down keys.

OPTIONING APPS
While selecting 'Settings' from the Charm bar when an app is open will bring up an app's

Task switching still works as it used to, only now it displays both desktop programs and Metro apps.





If you need a break from Metro, don't forget the classic desktop tile is your best friend!

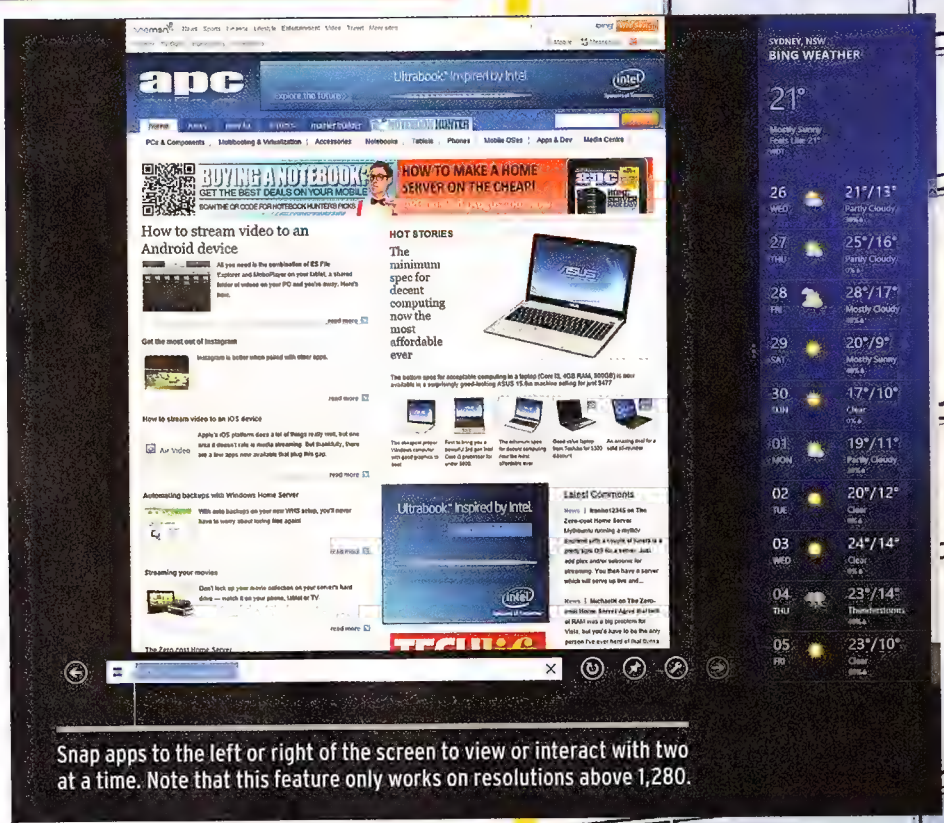
settings, an app's *options* are accessed by right-clicking anywhere in the app. For those apps that support it, this may bring up more than one bar (such as the navigation bar and tabs bar in Metro's IE).

TASK SWITCHING

The good things never change, and Alt+Tab is one of them. The difference now is that Alt+Tab will display both classic desktop programs and Metro apps, regardless of which interface you're in. Nice.

MULTITASKING

You can have two Metro apps side by side on the screen by pressing the Windows key+. (full stop) or Windows key+Shift+. for right and left, respectively. You can also drag the split bar that appears to reposition an app on the right or left side.



Snap apps to the left or right of the screen to view or interact with two at a time. Note that this feature only works on resolutions above 1,280.

FINDING PROGRAMS

Because of the lack of 'Start' menu, the only way to find classic desktop programs is through Metro's Search. Fortunately, this can be triggered just by typing anywhere on the 'Start' screen. It works well, too, although note that you need to click on 'Apps', 'Settings' or 'Files' after entering a search term to find what you're looking for.

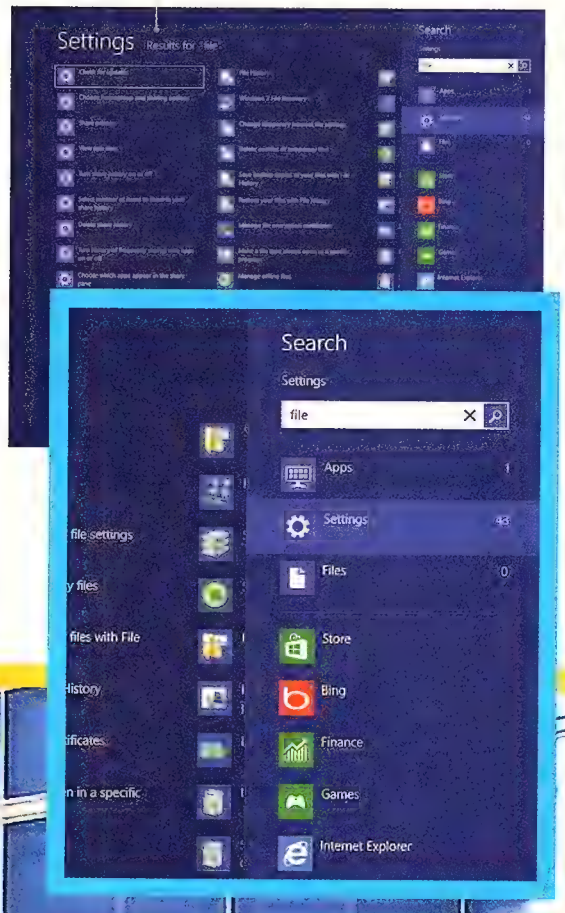
FORCIBLY CLOSE AN APP

Given that Metro doesn't close apps (only suspend them), if you want to forcibly close an app, move the mouse to the top of the screen until a hand icon appears. Then drag down to the bottom of the screen until the minimised image of the app fades away.

SHUTTING DOWN

Being designed for tablets, which never really power off, shutting down isn't a one-click affair as it was in Windows 7. To shut down, you can either click on your username in the top-right, select to lock the screen, drag the lock screen up, click on the power icon and then select 'Shutdown', or from the Charm bar, select Settings > Power icon > Shutdown. [LITE]

Just typing on the 'Start' screen will automatically bring up Metro's search engine.



HOTKEY CHEAT SHEET

Shortcut	Hotkey	Mouse
Metro Apps & Start screen		
Start Screen/last-used app	Windows key	Hover bottom-left corner
System-wide task switcher	Alt+Tab	N/A
Metro-only task switcher	Windows key +Tab	Hover top-left corner, move mouse down
Close a background Metro app	Windows key+Tab, release Tab and press Delete	Hover top-left corner, move mouse down, right-click > Close
Close active Metro app	Alt+F4	Hover top middle until hand appears, click and drag to bottom of screen
Snap Metro app right	Windows key+.	Hover top edge, click and drag app to the right
Snap Metro app left	Windows key+Shift+.	Hover top edge, click and drag app to the left
Start screen zoom out	Ctrl+-	Ctrl+scroll wheel down
Start screen zoom in	Ctrl+=	Ctrl+scroll wheel up
Scroll Start screen right	PgDn	Scroll wheel down
Scroll Start screen left	PgUp	Scroll wheel up
Lock screen, switch user, sign out, Task Manager shortcut	Ctrl+Alt+Del	N/A
Open Charm bar	Windows key+C	Hover top-right corner
Settings Charm	Windows key+I	Hover top-right corner > Settings
Share Charm	Windows key+H	Hover top-right corner > Share
Devices Charm	Windows key+K	Hover top-right corner > Devices
Metro Search (files)	Windows key+F	Hover top-right corner > Search
Metro Search right-snapped	Windows key+Q	N/A
Search apps	Start typing on Start Screen	Hover top-right corner > Search
Cycle through toast notifications	Windows key+V	N/A
Cycle through toast notifications in reverse	Windows key+Shift+V	N/A
Switch to classic desktop	Windows key+D	N/A
Classic & desktop		
Open Explorer	Windows key+E	N/A
Open quick menu	Windows key+X	Hover bottom-left corner > right-click
Open Run dialogue box	Windows key+R	Hover bottom-left corner > right-click > Run
Cycle through programs on the taskbar	Windows key+T	N/A
System-wide task switcher	Alt+Tab	N/A
Open pinned taskbar application	Alt+1 to 9	N/A
Aero Peek	Windows key+,	N/A
Magnifier zoom in	Windows key+=	N/A
Magnifier zoom out	Windows key+-	N/A
Lock computer	Windows key+L	N/A

Windows 8: the way forward

So what does *APC* recommend you do with Windows 8? Understand it as one needs to understand one's enemies, says Darren Yates.

There's an old saying that you should keep your friends close and your enemies closer, and that's probably what we'd suggest with Windows 8. While it works on a tablet, the Metro interface is diabolical on the desktop, especially with the way you can suddenly be thrown into it by an errant starting of a wrong app. The amount of screen acreage your mouse cursor has to cover in Metro is beyond what we think you gain from using the new interface. However, combine it with the fact that you're bound to pick up a PC or notebook at some stage that has it preinstalled, it's still worth knowing how Windows 8 works and then making it do what you want.

OUR RECOMMENDATIONS

Despite the fact that there are some very good features in Windows 8, for most it'll be an OS clouded by Metro and the lack of a 'Start' menu. So if you do decide to jump in, they're the first things we recommend you put back.

We've put together a simple app that installs the latest version of Classic Shell, the alternative 'Start' button/menu app. It also installs our own Metro bypass script so that as soon as any user logs in, it launches straight into the desktop, bypassing Metro in the process. You can read about it more on page 52, but basically, run it once and you're done.

If you're determined to give Metro a go and learn how to use it, we'd actually recommend a 'burn the ships' policy – forget the 'Start' button and stick with Windows 8 as it comes. But there's one other thing Windows 8 will come with: a steep learning curve. As much as Microsoft might give the impression that Metro is easy to use, thanks to its short 'here's how to use Windows' video clip during installation, there's no doubt you'll need time to get used to the way it works.

HARDWARE NEEDED

If you're buying the OS separately, the 64-bit version should be your choice. The only reason to buy the 32-bit version is if your system's CPU doesn't do 64-bit. Otherwise, load up your system with 8GB of RAM, install Windows 8 onto a 7,200rpm hard drive (if not an SSD) and give the drive a SATA 6Gbps channel if you can.

Because of improvements in the way Windows 8 boots and shuts down (it basically does a hibernate, so it boots up faster), you don't actually need to use an SSD to see significant speed improvements. Running a Sandy Bridge-class Core i5-2300 quad-core processor, Gigabyte GA-H77M-D3H motherboard and just the standard version of Windows 8 64-bit, our timing tests showed it boots into the Windows screen lock from POST in around seven seconds. You'll obviously see faster load times with an SSD, but it depends on whether the SSD storage cost is worth the extra couple of seconds to you.

USING IT ON PRODUCTION PCs

As always with a new OS, just be cautious about rolling it out onto production systems until you're sure that all of your must-use software works correctly. That means driver support for peripheral devices, too. However, driver support is one area Windows 8 does well – it'll just be older devices abandoned by their manufacturers that may cause trouble. For most situations, though, you shouldn't find too many issues getting your apps and devices running.

Microsoft's one-size-fits-all master plan for Windows 8 will only work on the desktop if we start seeing affordable touchscreens appearing on notebooks and desktop monitors damn quick. But if you can work around the flaws, it's worth a shot on existing hardware. apc

Windows 8 can be made to work like Windows 7.

Windows 8 interface – load it with apps and it gets busy.

Getting rid of Metro

Want the benefits of Windows 8, but not its Metro user interface? Darren Yates explains how to get rid of it.

You don't have to go far on the web before you start seeing the widespread criticism of Microsoft's decision to force-feed Windows users the tablet-oriented Metro user interface in the PC versions of Windows 8. It's a stupid idea that alienates people who use Windows on the desktop and don't plan on buying a Windows 8 tablet anytime soon.

But we think it's only slightly less stupid than getting rid of the 'Start' button/menu. Of course, it's all part of Microsoft's 'burn the ships' play with Windows 8 – if you want everyone using Metro, you don't give them the choice to use the old 'Start' button.

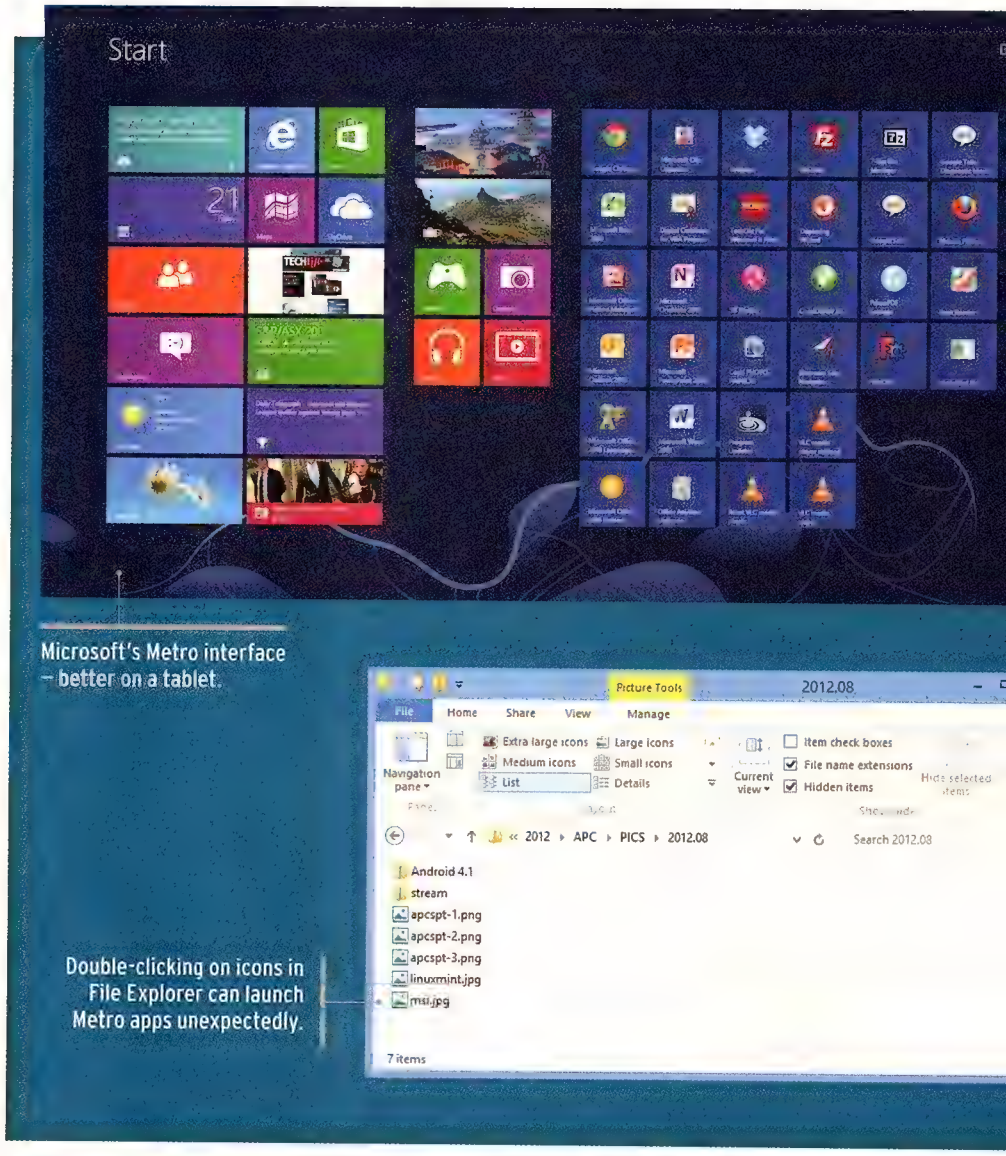
Despite that, Windows 8 actually has several excellent improvements over Windows 7, so rather than let Metro and the 'Start' menu issues get in the way of what is a pretty decent OS so far, you just need to knock it into shape.

HOW MUCH DO YOU LOATHE METRO?

One of the most annoying issues we've found with Windows 8 is its penchant for throwing up Metro versions of apps when you least expect it. This is especially the case if you're a little quick on the mouse trigger finger in File (formerly Windows) Explorer and you double-click on image files, such as .PNG and .JPG files. Metro's Photos app comes bounding to the fore and getting back out again is a pain, particularly when you can't really shut down Metro apps again. It's driven us barmy a couple of times so far, simply because it's just disruptive to our normal workflow. So really, Metro is the first thing we've got to fix if we're looking for a more Windows 7-style user experience.

It turns out there are two ways of getting rid of Metro – which one you use depends on how much you seriously want to see the back of Windows 8's new interface. The first option is more a bypass rather than running straight over the top of it. It forces Windows to switch to desktop mode as soon as anyone logs in.

The second option is a very clever method that's akin to a heat-seeking missile that targets Metro and kills it off – at least until you reboot again. It's risky, but not for reasons you might think – we'll explain why in a moment.

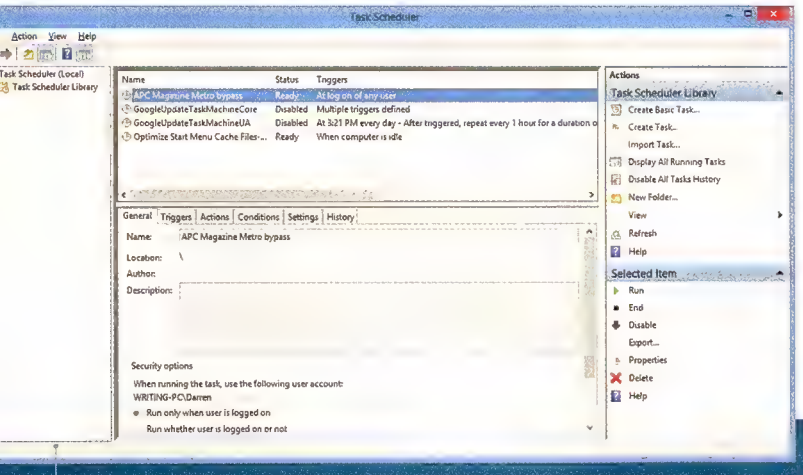


BYPASSING METRO

There was a rumour circulating the web just as Microsoft put Windows 8 RTM to bed that the software giant had ripped out all the features that would make it possible to bypass Metro, that we'd be locked into the new interface come hell or high water. Thankfully, that's turned out not to be the case.

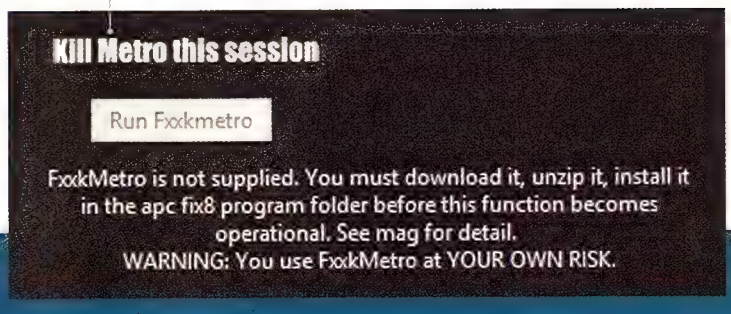
Although it's not visible, Windows 8 still has the 'show desktop' hotspot in the bottom-right corner next to Windows 8's system tray, similar to Windows 7. If you're running Windows 8, just move your mouse cursor there, ignore the Charms Bar that pops up, click on that corner and the desktop will appear.

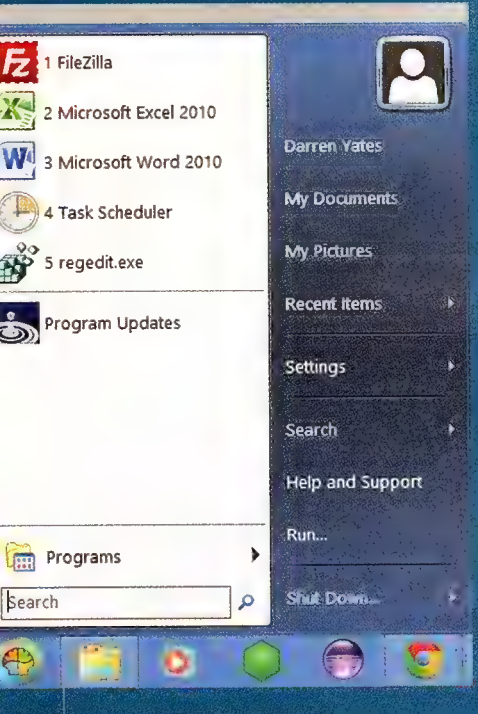
Another interesting wrinkle is the fact that the new version of File Explorer still uses a simple script language that originated back with Windows 95, which makes it possible to code this action. However, if you combine this with Windows' Task Scheduler and create a scheduled task that runs this code any time



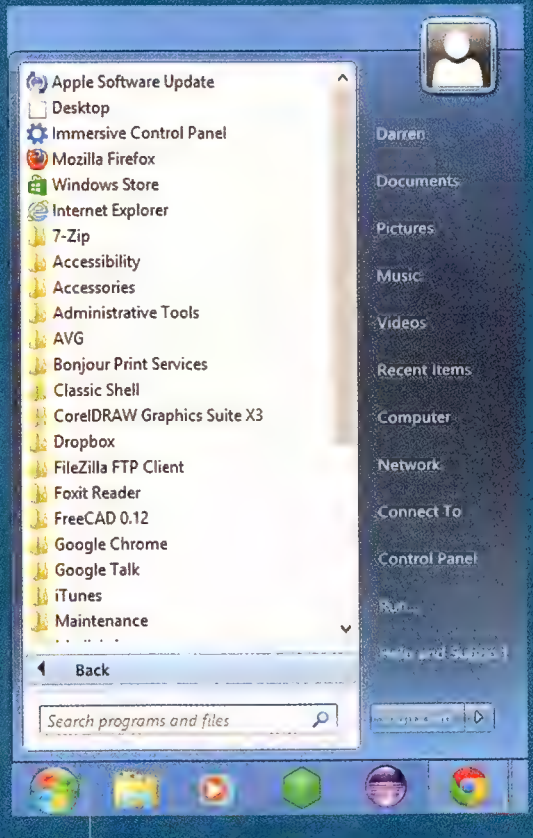
ing our login script and Windows' sk Scheduler, you can bypass Metro.

Fix8 can kill Metro completely – for serious advanced users only.

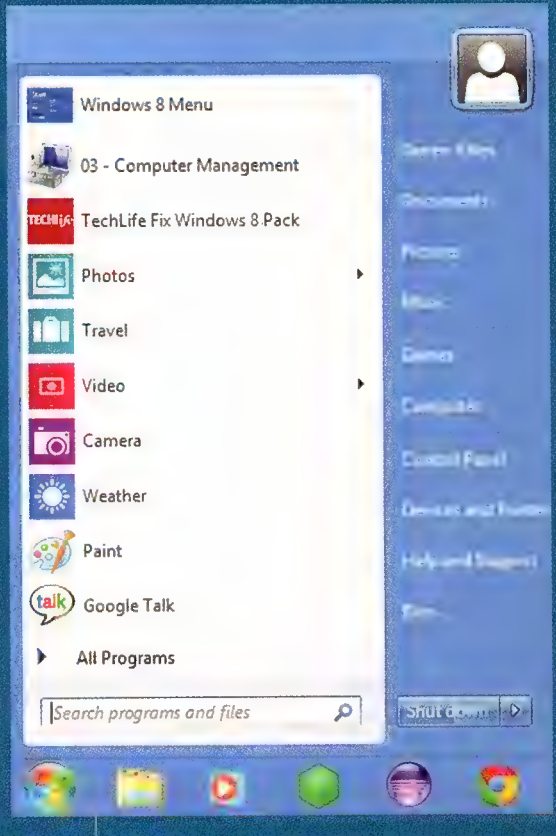




lassic Shell operating in Windows 8.



ViStart bringing a Windows 7 'Start' menu to Windows 8.



Start8 can also enfold Metro apps into your 'Start' menu.

someone logs in, Windows will run the code automatically and you'll go straight from the login screen to the desktop with barely a whiff of Metro. Metro is still there – it's just lurking in the background.

Frankly, we've found that being able to do this has been a great way to ensure our stress levels haven't risen before we've barely started the day! In fact, we've coded this bypass as part of our exclusive new APC Fix8 app (more on that in a moment).

BRING BACK THE 'START' MENU

After you've sorted out how you want to deal with Metro, there's still the problem that once you do get to the desktop, there's no 'Start' button or menu when you do get there.

The Metro interface might be controversial, but certainly going off many of the forums, there are plenty of users who have seemingly already decided Windows without a 'Start' button is a bridge too far and will stick with Windows 7 instead. However, the lack of a 'Start' button is one issue that's easily fixed and there are a number of ways you can do it.

Replacement 'Start' button/menu programs aren't exactly new and there are a few of them available on the web. Classic Shell (**tinyurl.com/yezy556**), ViStart (**tinyurl.com/cs7ro4**) and Start8 (**tinyurl.com/6tkkmgy**) are all capable of filling the void left behind by the 'Start' orb's demise.

Classic Shell is virtually a Windows XP 'Start' menu knockoff, although you'll find

some skins that make it look a little more like Windows 7. It's open source and very easy to install and uninstall. The right-click context menu on app menu listings is definitely a plus.

ViStart, on the other hand, could pass as a counterfeit Windows 7 'Start' menu system, it looks that good. The only thing to knock it back is the amount of adware toolbars it wants to install, so you need to be careful there. It can also get a little cranky at times and isn't the easiest to uninstall.

Start8 is another Windows 7 replica program, but even using just the 0.90 Beta from **softpedia.com**, it's clean and pretty robust. Version 1.0 is now available from the developers, Stardock, but you have to give them your email address to get it. If you're happy with the beta, you can get that unencumbered from Softpedia.

Other than those comments, with all three, once installed, you've basically got full 'Start' button/menu functionality back into Windows 8.

INTRODUCING APC FIX8

Rather than have to play with each of these issues and solutions separately, we've put all of it together into a single exclusive app called APC Fix8. It gives you the option to install and uninstall the Metro bypass script as a scheduled task that activates on login, and it downloads and installs your choice of Classic Shell or Start8 to give you the 'Start' button back. (Because of ViStart's adware, we've not included it in our app).

It has one other feature and that's to act as an interface for a command line app called FxxkMetro.exe, which will kill Metro stone dead – at least until you reboot. But as you'll read in the story opposite, we haven't included the FxxkMetro.exe app in our software, simply because we can't be perfectly sure that it's totally safe.

The app originates from a Chinese web site and although we've scanned and tested it without issue, we can't make any guarantees as to its safety for your system.

Read through the advanced 'Kill off Metro completely' story for details on what the app does, where to get it and where to install it. Once that's done, the 'Run FxxkMetro' command button in APC Fix8 will be enabled and you'll be able to send Metro on its way.

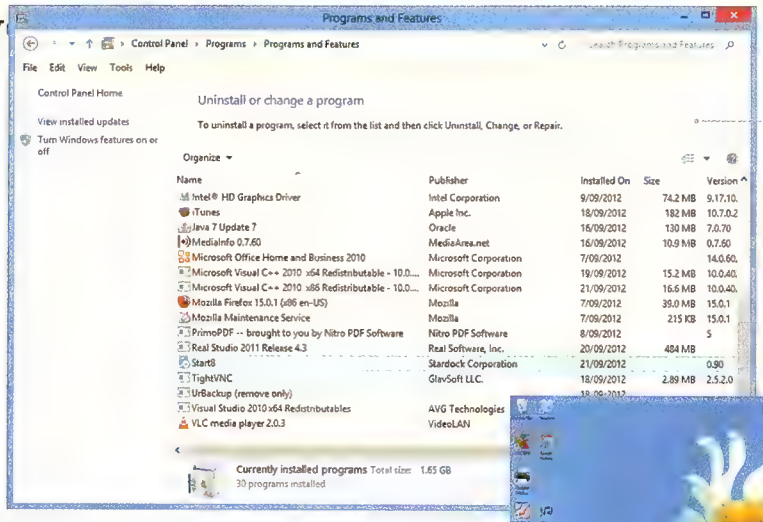
Our app doesn't include Classic Shell or Stardock's Start8, but it does work as a basic download manager, allowing you to grab versions 3.6.1 of Classic Shell direct from **sourceforge.net**, and the 0.90 beta of Start8 from Softpedia's alternate download link at **tinyurl.com/9qumru9**.

Once downloaded, Fix8 silently installs your choice so you should just see the 'Start' button quietly pop up on the taskbar.

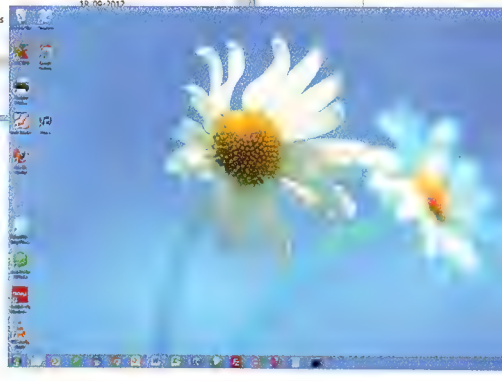
The way we implement the Metro bypass scheduled task is a little bit roundabout. We start off with a Task Scheduler-ready .XML task file and modify it with the final location of the APC Fix8 folder.

The .XML file itself tells Task Scheduler to run the 'apc_kill_metro.scf' Explorer script file we've written whenever a user logs on. Next, we use the Windows 'schtasks.exe' command line app to add the task to Task Scheduler.

As we said, it's a bit roundabout, but doing it this way we can add the task automatically with just the touch of a button.



'Add/Remove Programs' is required to uninstall Start8.



You can make Windows 8 look more like Windows 7.

UNINSTALLING THE FIX

If for some reason you decide you want to go back to Windows 8's default settings, just launch the APC Fix8 app, click the 'Remove Bypass' button and the scheduled task we created will be deleted. The next time you reboot, you'll be greeted by Metro.

The app can also initiate the uninstall procedure for your choice of 'Start' button app, silently uninstalling Classic Shell and launching 'Control Panel › Add/Remove Programs' to begin uninstalling Start8.

As we mentioned before, FxxkMetro's changes aren't persistent and Metro will reappear as soon as you reboot your system.

WINDOWS 8: WORTH A GO

As much as you or I or a fair proportion of the web might dislike Metro on the desktop and the lack of a 'Start' menu, you don't have to let those flaws put you off. Once you get it under control, there are enough improvements and new features that make Windows 8 one of the fastest operating systems Microsoft has so far developed. It's just a pity we have to go through Metro on the desktop to get it.

USING OUR EXCLUSIVE APC FIX8 APP

Fix8 gives you individual control over how you want to fix your Windows 8 user experience and comes as three separate sections: 'Bypass Metro on login', 'Kill Metro this Session' and 'Reinstate Start Button/Menu'.

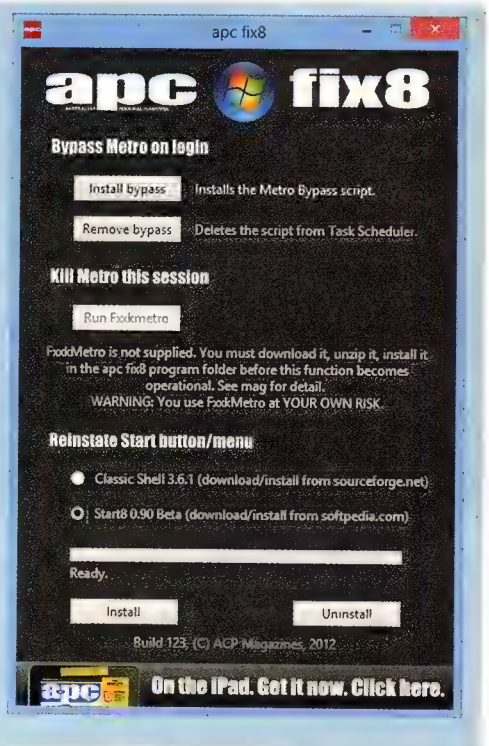
'Bypass Metro on login' allows you to add the Metro bypass script to Task Scheduler. You can also delete it if you wish.

Kill Metro is a placeholder for the FxxkMetro app (it becomes enabled once you've downloaded it, scanned it and copied it to the Fix8 program folder – see the main story for details) and disables the Metro thread in File Explorer.

'Reinstate Start Button/Menu' gives you the choice of downloading and silently installing either the Classic Shell or Start8 'Start' button/menu apps.

APC Fix8 works on any version of Windows 8, including 32 and 64-bit versions. While it's been extensively tested, it comes with no warranty of any kind – use at your own risk.

You'll find the APC Fix8 app for free download at **apcmag.com/fix8.html**.



APC's exclusive Fix8 app handles Metro and the missing 'Start' button.

ADVANCED USERS ONLY:

Kill off Metro completely

If even a whiff of Metro is too much, there's a way to kill Metro completely, although it's not for the faint-hearted.

Moving Metro to the background as the Task Scheduler hack does is fine, but if you're after a more permanent solution, there's one available that kills Metro – at least until you reboot. Of course, that's if you're game to try it.

For the past few months, a tiny utility has been quietly lurking around the web called FxxkMetro. Released by the Chinese web site PCBeta (**tinyurl.com/95e776l**), you can find it on various Windows 8 forums (unfortunately, it requires you to log in to download it). It's only 56KB, but run it once and Metro is gone – there's no Charm Bar, Windows key+C shortcut and no corner hotspots to bring up anything.

Sadly, the developer hasn't released the source code, so we ran it through Microsoft's Process Monitor to see what FxxkMetro did. It turns out Metro is a process thread of File Explorer (explorer.exe), which has always been more than just Windows' file management app and controls much of what happens around the Windows desktop.

FxxkMetro acts like a smart bomb, seeking out which thread controls Metro and killing it off. Check out the screenshot of Process Monitor's live capture of Fxxkmetro and the Explorer thread exiting at right.

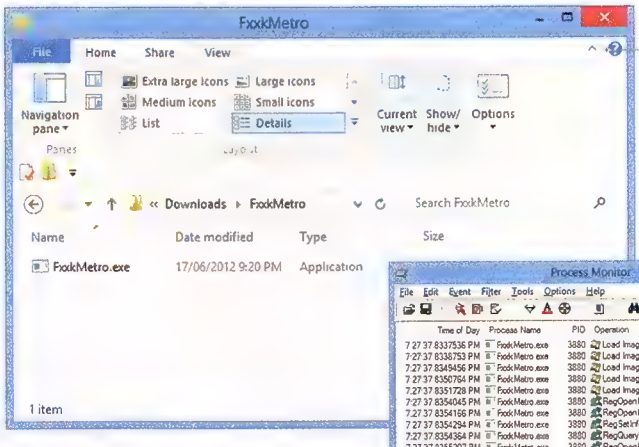
However, Metro's demise is only temporary. Because it just kills off an Explorer thread, that thread restarts when the system reboots. Still, it's an impressive bit of code but not without side effects – you do lose the quick admin right-click context menu at the 'Start' menu corner and you also lose the left-click network menu option. Basically, anything associated with Metro is rubbed out.

IS IT SAFE?

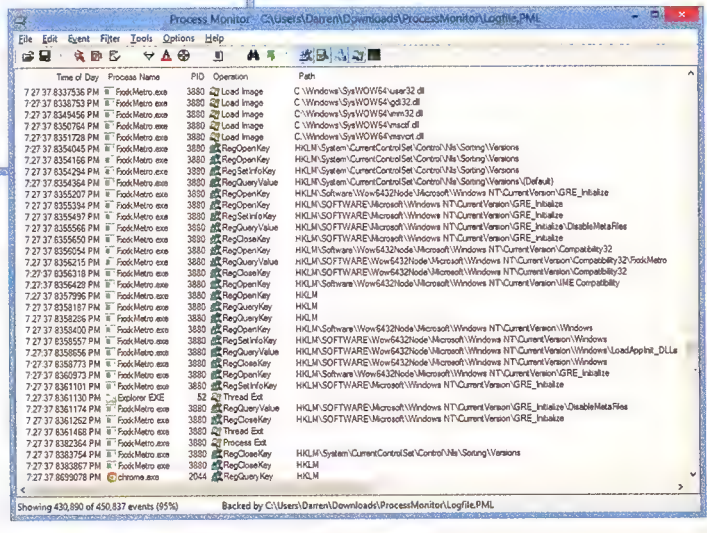
We've scanned the app with AVG Antivirus without issue and we tested it and it works, but given its origins we can't say it's perfectly safe. We can't find it on any of the major download sites, but it does appear on Windows 8 forums where it's generally been positively received.

So, while it's a command option inside our APC Fix8 app, you have to provide the FxxkMetro app yourself. You'll first need to download it from **tinyurl.com/d5ynjpf**, scan it for viruses, unzip it, scan the FxxkMetro.exe file and copy it into the APC Fix8 program folder at \Program Files(x86)\APC Fix8\.

Be warned, though: you use FxxkMetro at your own risk.



FxxkMetro.exe, a tiny utility that kills Metro dead.



Microsoft's Process Monitor shows FxxkMetro killing the Metro thread.

HOW FXXKMETRO WORKS

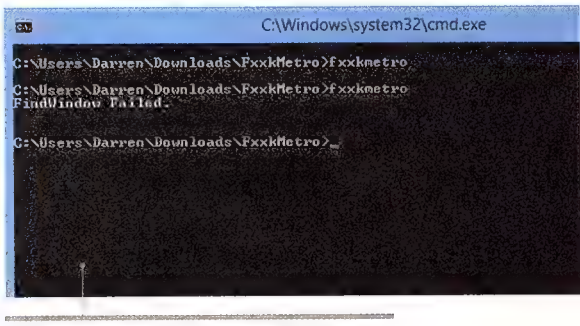
At this stage, exactly how FxxkMetro works is a bit of a mystery without any source code to peer through. However, from monitoring how the app works in operation and through Process Monitor, it's clear that it identifies a particular thread in Explorer using the Windows API's window classes.

Each window of a Windows app has a different class name. For example, the taskbar at the bottom of your Windows desktop has the class name Shell_TrayWnd. Using Windows API commands such as **FindWindow** and **ShowWindow** , you can programmatically make the taskbar disappear and reappear without having to touch the registry or the taskbar itself.

Early reports suggest the Metro interface uses the class name Windows.UI.Core.CoreWindow, but it's not clear at this stage if that can be used to somehow identify Metro's Explorer thread.

Running FxxkMetro a second time brings up a 'FindWindow failed' error, so we're assuming for now that it's looking for a particular window class that's associated with Metro and using that as a key to finding the right Explorer thread to kill.

Whatever the case, FxxkMetro was apparently designed as 'entertainment only', according to the developer on the PCBeta web site, which says it's not up for everyday use.



Running FxxkMetro a second time produces the 'FindWindow Failed' error.

However, the fact that it actually works suggests there's enough in the concept to enable a full-on Metro-killing utility to be developed, which certainly wouldn't please Microsoft one little bit.

Bring it on, we say.

Learning to use Metro

Is it possible to love Metro? Darren Yates looks at how to best learn Windows 8's new interface.

When Microsoft released Windows Vista, the cacophony of complaint from users over UAC was almost deafening. That one feature alone spawned a very funny Apple ad and consigned Vista to become one of the worst versions of Windows ever. But by the time Windows 7 arrived, the software giant had learned from its over-zealous use of UAC, toned it down and everyone has basically gotten on with it since.

While Metro might end up challenging UAC for plumbing the depths of unpopularity, Microsoft's plans for the new interface are so all-encompassing that we're not likely to see it go away any time soon. So it might well be a case of learning to love it – or at least learning to live with it, if you can't go that far.

Learn to tweak Metro and you can give the 'Start' screen your own flavour.

KEYBOARD SHORTCUTS

Functionally, the biggest problem with Metro on the desktop is the whole lateral side-to-side movement thing that you have to do with your mouse. If anything, Metro is a case in point of how exceedingly difficult it is to create a great user interface that's equally adept at being used by your finger and your mouse.

Still, Windows has always enjoyed a multitude of keyboard shortcuts to make common tasks and controls easier and faster. If you never learned them in the past, now's the time to start. Windows 8 comes with a raft of new Metro-focused shortcuts – we've included some of the more common ones based around the Windows key in the table on page 50, but you'll find the complete list at the MSDN blogs at **tinyurl.com/d48msj7**.

If you're still using mostly Windows desktop-style apps, the first one you'll want to learn is Windows key+D, which is the 'show desktop' shortcut.

METRO SEARCHES

One trap for new players (he says after falling into it a few times himself) is the new Metro search engine. Unlike File Explorer's search option, you'll find that Metro separates its search results into 'Apps', 'Settings' and 'Files'. That means if you're looking at 'Files' results, you need to also keep an eye on the search bar for results in the other two categories. The main screen will tell you the number of 'All' results, but it's only counting for that category, not the overall search, so you might end up thinking you can't find something when it's actually listed in another category.

Unfortunately, there doesn't appear to be a way to make all the search results appear in the one window, so remember to check for other category results.

FINDING WINDOWS UTILITIES

One of the things that having a 'Start' menu for 17 years does to you is it conditions you to find things like the Task Scheduler in the 'Administration Tools' menu or WordPad in the 'Accessories' menu. You almost know instinctively where to find those Windows system utilities.

Because Metro is effectively a 'Start' menu rebuild (spare me this 'reimagined' nonsense), there's no getting around the fact that you'll need time to just potter around Metro and learn where everything is.

Not only that, but a good number of Windows utilities have been renamed. For example, don't bother to search for **Disk Defragmenter** in Windows 8 – you won't find anything. If you search for **defrag** you'll find one entry under 'Apps', which is the old command prompt version, but there are two under 'Settings'.

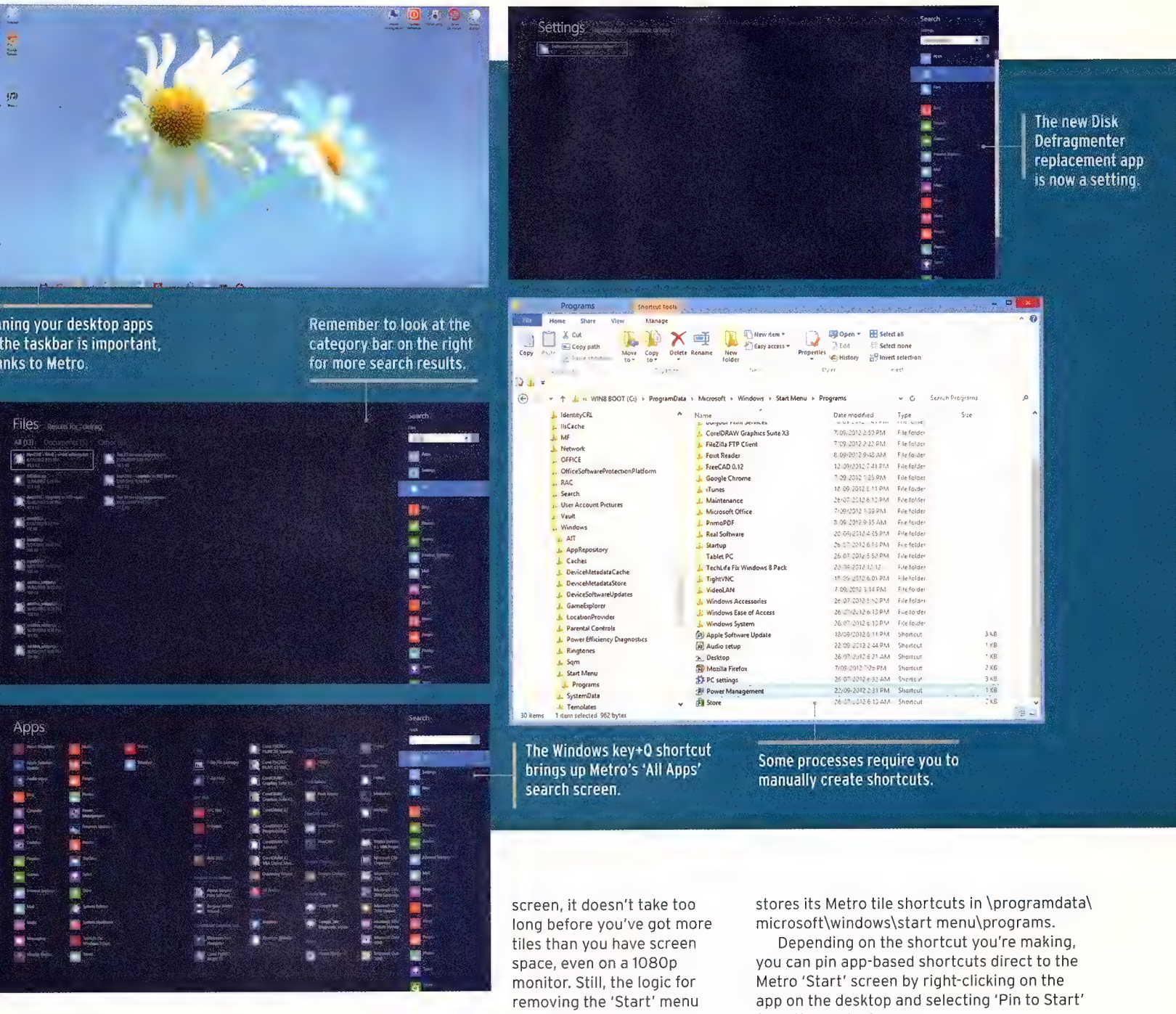
It turns out that Microsoft has changed Disk Defragmenter to Optimize Drives (yes, that's with a 'z'). Even more frustrating, it doesn't appear in the app search results – it's apparently now a setting. And after all that, it's actually a desktop app anyway.

Another example, Windows 7's 'Backup and Restore' becomes 'Windows 7 File Recovery' in Windows 8. Actually, despite including it, Microsoft recently stated that 'Backup and Restore' is now deprecated and would rather you use Windows 8 Recovery. You can read about it at **tinyurl.com/9y6kcgp**. It'd be like saying 'read the manual', but while plenty of Windows 8 will be familiar, there's a pretty decent chunk of it that won't.

SET DEFAULT FILE ASSOCIATIONS

Metro isn't just a replacement 'Start' menu, although it does incorporate one – it's a whole new user interface layer and you'll find yourself being shunted early on between the traditional desktop and Metro apps, depending on the default file associations you have set in Windows 8.

Opening up JPEG and PNG images is one example where the swapping becomes chronic. Windows 8 has two options for previewing or



displaying images: the Metro-based Photos app or the Windows Photo Viewer desktop app, and the default option seems to always be the Metro app.

The same thing goes for videos. The problem with the Metro Photos app is that it has no right-click context menu to allow you to open the image in another app. If you want to reduce the frequency of this occurrence, you'll need to change the default app file associations for each file type to either one of your installed apps or one of Windows' desktop options.

PIN YOUR FAVOURITE APPS

Microsoft says one of the reasons it moved to Metro is because it had feedback from users that they weren't using the 'Start' menu anymore, but were pinning their favourite apps to the taskbar instead. However, as a result of Metro, you might find it easier to start pinning your favourite apps to the taskbar.

Given the size of tiles in Metro's 'Start' screen, it doesn't take too long before you've got more tiles than you have screen space, even on a 1080p monitor. Still, the logic for removing the 'Start' menu escapes me if you allow Metro *and* taskbar pinning. If you're allowing two options, why not keep the 'Start' button, make it three and keep everyone happy?

CREATING YOUR OWN TILES

One of the things I'm most surprised about is how hard it is to reboot or simply turn off your computer in Metro. You need to bring up the Charm bar, select 'Settings > Power' and finally 'Power off' or 'Restart' from the context menu. The old 'Start orb > Shut down' option was a lot simpler. Even using the Windows key+I shortcut to bring up Metro's 'Settings' bar still requires you to select 'Power' and then your shutdown or restart option.

The most obvious feature of Metro is the tile-based shortcut structure, designed to bring a 21st century update to the old static shortcut icons. Something Metro doesn't do easily is allow you to make your own tile shortcuts, although it's possible. Windows 8 stores its Metro tile shortcuts in \programdata\microsoft\windows\start menu\programs.

Depending on the shortcut you're making, you can pin app-based shortcuts direct to the Metro 'Start' screen by right-clicking on the app on the desktop and selecting 'Pin to Start' from the context menu.

Shortcuts for Windows processes such as launching the Power Management window, for example, require you to manually create a shortcut first, copying it to the above folder and then searching and pinning to the 'Start' screen from within Metro itself. Check out the 'Create a Metro system shutdown shortcut' step-by-step guide on page 59 for full details.

- **Bonus points.** Following on from the step-by-step guide, you can also create an 'Abort system shutdown' shortcut by following this same process with the command **shutdown /a /c "Shutdown aborted."** instead. The **/a** switch aborts a shutdown you've activated provided you do so within the set time period of that activation, in our case, seven seconds as set by the **/t 7** switch. The **/c** switch allows you to display an optional message up to 512 characters. To create a 'System Restart' shortcut, replace the command in Step 2 with: **shutdown /r /t 7 /c "System will**

reboot in seven seconds." The /hybrid switch tells the shutdown app to shut down Windows and prepare it for fast startup, but it only works in conjunction with the /s (shutdown) switch.

- **Extra bonus points.** To create a shortcut for a Windows process such as the 'Power Management' applet, follow the step-by-step guide opposite, replace the shutdown command in step 2 with powercfg.cpl , but at step 5, copy the shortcut to \ programdata\microsoft\windows\start menu\programs instead. Then search for it by name in Metro (just start typing on the Metro 'Start' screen), right-click the shortcut and pin it to the 'Start' screen.

REMOVING UNWANTED TILES

Because Metro's 'Start' screen not only holds tiles for Metro apps, but desktop apps as well, it won't take long before you're overloaded with tiles. Removing unwanted tiles doesn't have to mean deleting the apps that go with them – you can just unpin the apps from the 'Start' screen. Simply right-click the tile, select 'Unpin from Start' and it will disappear, although the app will still be available.

Rather than unpinning tiles everywhere, there's another way to get a bigger view of the 'Start' screen and that's to use the zoom out button. Go to the 'Start' screen and if your tiles overflow the screen space, you'll see a minus sign block on the bottom-right – click on it and it'll toggle the zoom out and back in. However, you can't activate individual tiles from that zoomed-out view, but you can choose which tile group you want to come into central focus on the screen. You can also perform the zoom trick by holding down the Ctrl key while on the Metro 'Start' screen and rolling your mouse's scroll wheel down and back up.

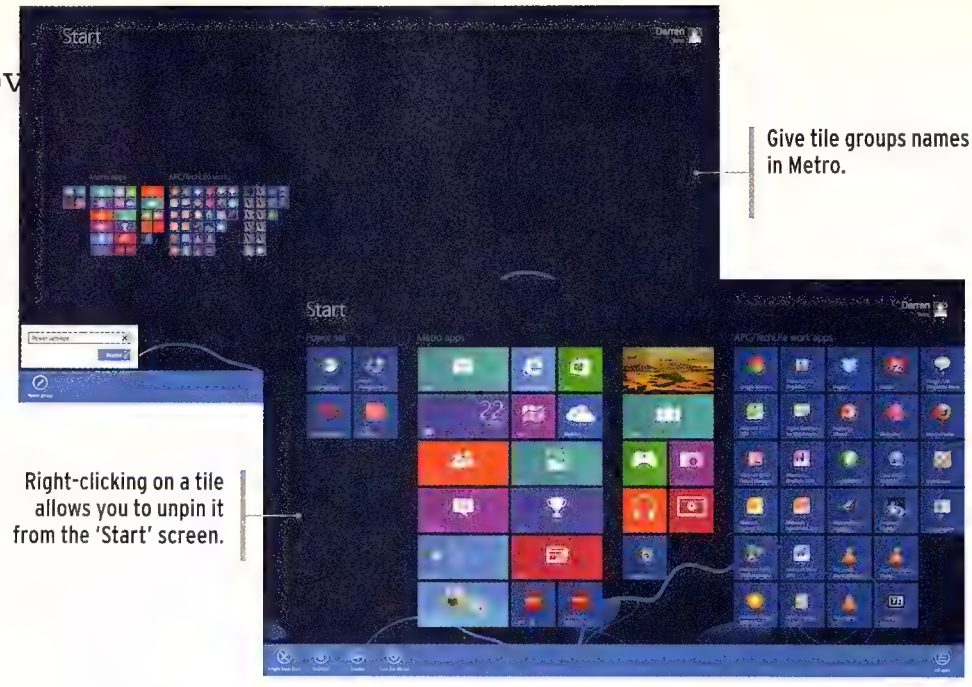
CREATING & NAMING TILE GROUPS

Much like you can with Windows 7's 'Start' menu, you can create tile groups in Metro simply by dragging a tile to an empty space on the far right or left of the 'Start' screen. Metro will throw up a divider block to indicate you're creating a new group. Let the tile go and the new group will be created. Adding new tiles is as simple as dragging tiles from other groups and dropping them into your new one.

You can also name your groups – use the zoom out option (either the bottom-right scroll button or Ctrl+mouse scroll wheel down), right-click on a group and select the 'Name Group' option on the context menu. Type in the name you want to use, click the 'Name' button, zoom back to normal view and you'll see your group name above your tile group.

TURN OFF LIVE TILES

Another issue you might find with the 'Start' screen is Live Tiles – Microsoft's new-generation icon feature that provides live data feeds straight to the tile. Get a few of those with data scrolling around and the screen can get a bit overwhelming. To turn off this feature, right-click on the tile in question, select 'Turn live tile off' from the bottom menu and it'll go back to its static state. Unfortunately, there doesn't seem to be a way to turn it off globally, so you'll have to do this one tile at a time.



METRO OR DESKTOP APPS?

With the release of Windows 8 not that far away, the number of Metro apps is still surprisingly small and we can only speculate that Microsoft will be ready to launch plenty either on or very close to October 26. It remains to be seen just what sort of support Metro will get for productivity apps, although we already know that Office 2013 will support the interface.

Still, this is where the device you run Metro on will contribute highly to whether it's worth investing in Metro apps, particularly in terms of productivity apps.

While it's important to understand Metro, given that it's an integral part of Windows 8, it's pretty obvious that desktop apps will still remain the best option for traditional desktop and laptop users.

The bottom line is basically this: don't jump into Metro apps for the sake of Metro unless you have the hardware – namely a touchscreen tablet or computer – to make the switch worth the effort.

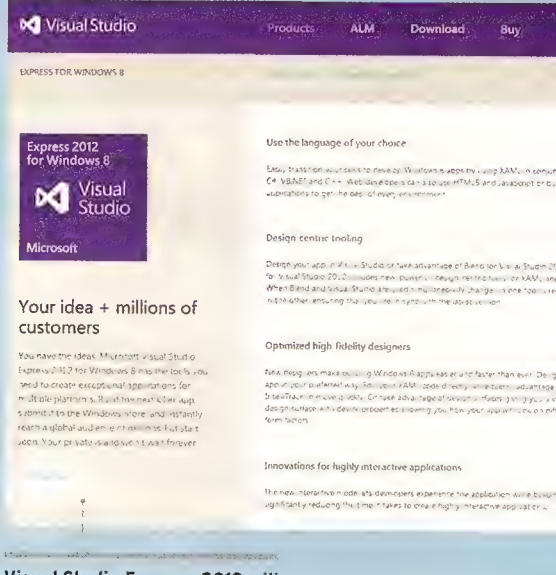
KNOCKING IT INTO SHAPE

Much like Windows 8 itself, Metro can be made to work better on the desktop if you're prepared to put in the effort and tweak it. Easily the most important things to learn are the major Metro keyboard shortcuts: use Windows key+D for 'show desktop', Windows key+C to display the Charm bar and Windows key+Q for 'show all apps'. That will at least get you moving between Metro and the desktop with relative ease.

But there's no doubt that if you can get your hands on a touchscreen monitor, it certainly wouldn't hurt.

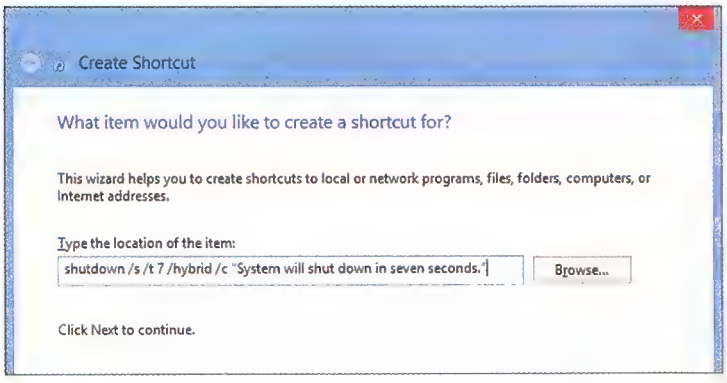
WRITE YOUR OWN METRO APPS

Given that Metro is to be the platform for Microsoft's Windows Store apps, you can develop your own Metro apps and do so in a number of different languages, from web-based options such as HTML5 or CSS and Javascript through to C++ and Visual Basic using Microsoft's .NET framework and XAML. You'll need a few tools to get started, not the least of which is Windows 8 itself (you can't develop Metro apps in any other OS). You can add to that the Visual Studio Express 2012 development app, the Windows 8 SDK and the project templates for your language. You'll also need a Windows Store developer's licence, but you can get that free through the Visual Studio app. If you want to know more, head to MSDN and start going through the 'Getting Started' guide at **tinyurl.com/6t85jub**.

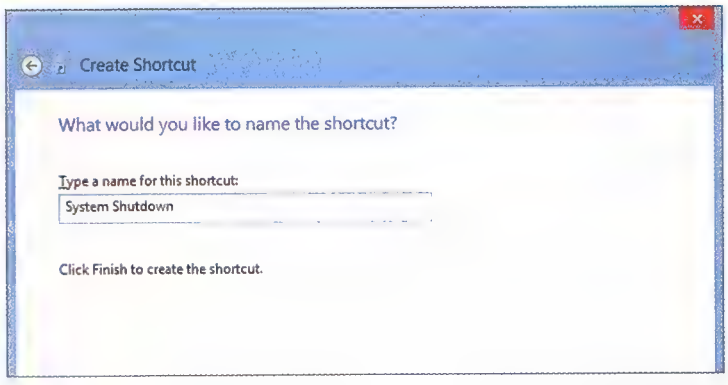


Visual Studio Express 2012 will help you make Metro apps.

CREATE A METRO SYSTEM SHUTDOWN SHORTCUT

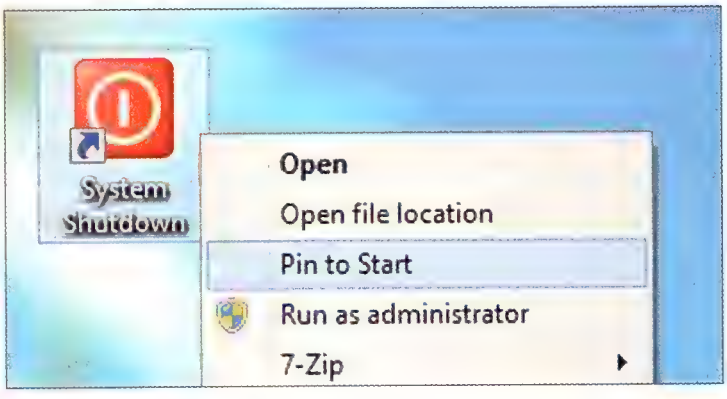


01 Right-click on an empty space on the Windows 8 desktop and select 'New > Shortcut' from the context menu. In the 'Create Shortcut' window, type shutdown /s /t 7 /hybrid /c "System will shut down in seven seconds." and click the 'Next' button.



02 After that, give your shortcut a name; for example, System Shutdown and click the 'Finish' button.

03 To change the icon, right-click the shortcut and select 'Properties > Change Icon'. Ignore the error warning and click on the red power icon in the 'Shell icons' list. Click the 'OK' button and then 'Apply' on the 'Properties' window.



04 Back on the desktop, right-click on the shortcut and select 'Pin to Start'.

05 Launch Metro's 'Start' screen, locate your shortcut (it might be off to the right of the screen) and drag it to your desired location.

06 Click on it and try it out. You should see the Metro screen show your message before shutting down.

BEST BACKUP STRATEGIES

There are myriad options for backing up these days, from RAID to cloud storage. Nathan Taylor reveals the best ways to ensure you never lose your most important data.

It's a fact of life: one day your PC's hard drive will fail. It could be tomorrow, it could be years from now. If you're lucky and prepared, you won't lose your precious photos, movies and documents when it does. The prepared part is about having a sound backup strategy. You could copy your files to an external hard drive, a NAS device or a cloud drive.

You could have RAID (Redundant Array of Independent Disks) drives for extra hardware redundancy. You should definitely have backup software running, either a periodic backup solution like Windows Backup or a continuous solution like Memeo or Acronis.

So which solution will work best for you?

INTERNAL HARD DRIVES & RAID

Having multiple hard drives in your computer – an option usually only for desktop computers – is one of the simplest solutions, although it does have its problems. Obviously, if something happens to the computer itself (if it's stolen or lost, for example), you lose everything. Still, having an extra internal drive provides redundancy for your main hard drive, it's fast and it's always there. You can use traditional drive-to-drive backup solutions like Windows Backup, but a lot of people prefer a RAID solution. When used for reliability, RAID mirrors data across several drives automatically; if one of them fails, the backups take over instantly and automatically, with hopefully no downtime.

True RAID requires a hard disk controller in your PC that supports it and those are only available in a limited selection of desktop systems. You can also create a software RAID setup in Linux and Windows. If you want to get the most out of it, you should also have drives with the same capacity, otherwise it uses a lowest common denominator model. For example, if you want to create a mirror drive (RAID 1) and you have a 1TB and 2TB drive in your PC, the merged mirror drive will be 1TB.

A final note: a partition is not a drive. Many computers come with multiple partitions; for example, a single physical hard drive that's split into two virtual hard drives. So you have, say, a C: drive and D: drive, but only one physical disk. This has its uses for data recovery due to accidental deletion and for factory system restoration – you can store all your data on the second partition and format the first – but it doesn't protect against hardware failure.

BACKUP PROS & CONS: INTERNAL HARD DRIVE

PROS:

- It's fast.
- It's always there.
- In the case of RAID, it's automatic and continuous.

CONS:

- It doesn't protect against total computer loss.
- RAID doesn't help with accidental file deletion, just hardware failure.
- In case of computer failure (as opposed to hard drive failure), getting your data back can be very painful.

EXTERNAL HARD DRIVES

By far the most popular backup solution, external hard drives are cheap, ubiquitous and easy to use. Combined with automated backup software, they can keep a second copy of your important files ready and they're easy to transport to a new PC for recovery, unlike internal hard drives. Thanks to USB 3.0, they're fast now, too, and backups shouldn't take more than a few hours, even for the initial backup. They do have their downsides, however. USB drives typically only have a single drive inside, so there's no additional hardware redundancy, and because they often get moved, dropped and jostled, their lifespan might even be less than an internal hard drive. More importantly, you need to remember to plug them in when backup time rolls around. That might not seem like a big thing, but people regularly go for months between backups for that reason.

BACKUP PROS & CONS: EXTERNAL HARD DRIVE

PROS:

- It's cheap.
- It's easy to understand.
- It's portable and very easy to recover data from on a new PC.

CONS:

- You need to plug it into the computer at backup time.
- Limited capacity might prevent full system backups.
- No additional hardware redundancy.

NETWORK-ATTACHED STORAGE (NAS)

Rather than plug into your computer, NAS devices plug into your network. That makes them a shared storage medium, which is perfect for multiple computers. NASs come in multiple flavours, from single-drive devices to multi-bay servers with support for RAID. These days the term 'network-attached storage' is also something of a misnomer; even low-end NASs have substantial server functions, including file and media services, web services and even other application services.

As a backup medium, a multi-drive NAS beats an external hard drive on most important metrics. You can back up multiple PCs to it, without having to carry the NAS from one to the other. It can serve media and files to your network media players. You can create a RAID setup if it's a multi-drive NAS, so even if one of the drives in the NAS fails, nothing is lost. It's always present for all the computers on your network. Some even have built-in cloud features, so you can access your storage from anywhere.

However, price is a factor for many. For home users, a four- or five-bay NAS solution is an outstanding backup solution (bays refers to the number of physical hard drives it can support) with tremendous capacity. Four-bay NAS devices start at around $350 and that's before you put drives in them. Commonly, it'll cost you in excess of $1,000 for a full kit. One- and two-drive NASs are also available, but they're less useful since you commonly can't put them in a RAID for added protection against hardware failure.

BACKUP PROS & CONS: NAS

PROS:

- Multiple-computer access.
- Always on, always available.
- RAID protects against hardware failure.
- Often has extensive media and application server functionality.
- Massive capacity with multi-bay NASs, perfect for full-system backups.

CONS:

- Expensive to set up initially
- Can be somewhat technical.
- Can be slower than USB, especially over Wi-Fi.
- Windows 7 Home Backup isn't fond of network backups.

CLOUD STORAGE

With cloud storage, your important files are uploaded over the internet to an off-site server. This has substantial advantages, the biggest being that even if your house or office burns to the ground, you can recover your data. You can also recover your data from anywhere and it's managed by professionals who build server farms with massive redundancy and continuous uptime. Quite simply, if you go the cloud route you never really have to worry about losing your data.

The downside is that the initial backup can be brutal, a process that can literally take weeks and totally gut your monthly broadband quota. Subsequent backups are quicker, since they only update changed and new files, but you'll still likely be using a lot of data. Recovery is faster, since broadband download is generally faster than upload, but it can still be time-consuming. Check out our roundup of cloud-based backup on page 70 for more information on these services.

BACKUP PROS & CONS: CLOUD STORAGE

PROS:

- Almost total data security.
- Data is available from anywhere.

CONS:

- You have to a pay a subscription fee.
- Slow backups and recovery.
- Possibly limited volumes.

SO WHICH WAY SHOULD I GO?

Ultimately, the answer depends on how much you're willing to pay. The cheap and easy solution is the external hard drive, but it can be prone to failure and require that you remember to plug it in for backup. The forgetfulness factor isn't one to be dismissed. You'll occasionally forget to plug in an external drive, unless you leave it permanently attached. Internal drives can work, too, but they can be technical to set up, require specific hardware and recovery can be a pain. RAID setups protect you against hardware failure, but not accidental deletion. NASs are a better solution, especially ones with multiple drives set up in a RAID. The chance of hardware failure catching you off guard with these is very small. Cloud solutions are the ultimate security, since these are stored off-site and managed by (we hope) professionals. The downside is their annual fee.

PLUG-IN CAPACITY

Sometimes the simplest backup solution is the best. Nathan Taylor tests 21 of the latest external hard drives.

No backup solution is easier to understand or implement than the external USB hard drive. After all, you just plug in the hard drive and either run your backup software or manually drag and drop the files you want to copy. You don't have to crack open your computer, sign up for an online service or endure interminable upload times, and they're much cheaper than NAS-based solutions.

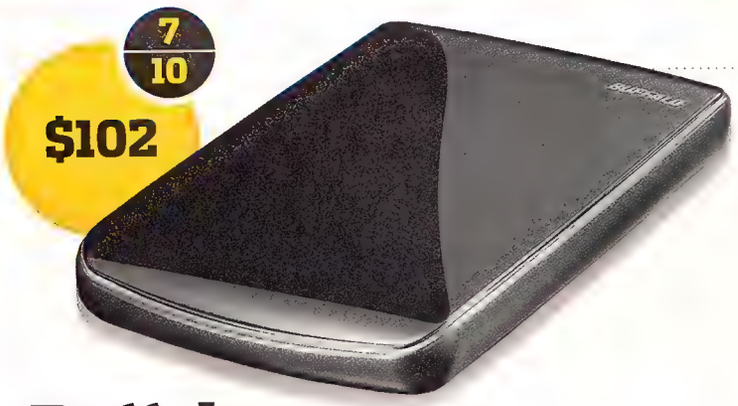
In fact, you can readily get 1TB of storage for less than $100 now, which should be at least enough to store your entire picture and music collection, and possibly even do a full image backup of your PC. What's more, the introduction of USB 3.0 – which is 10 times faster than USB 2.0 – has made external drives push the performance of internal drives. It's come to the point where you can even use external drives as system disks if you've a mind.

There are two types of external drives you can get: portable drives, which require no mains power and just need to be plugged into a USB port; and desktop drives, which usually have greater storage capacity, but will need to be plugged into a power socket as well as the computer. We've reviewed both types here. With the exception of a handful of USB 2.0 devices (which are noted as such), all the drives reviewed here are USB 3.0 and were tested with USB 3.0. If you only have USB 2.0 on your PC, you can still use them, but they won't perform nearly as well, since the slower USB link will throttle their ability to transfer files.

PORTABLE DRIVES

Portable drives are the epitome of plug-and-go solutions and they've been constantly improving in the last few years, to the point where desktop solutions are almost becoming obsolete. We've broken down portable drives into two categories: affordable portables, for devices with less than 1TB of storage, and super-sized portables, with 1TB and more capacity. The affordables can often be readily found for $90 or less, and are a very cheap way to get a backup solution up and running. If you have more media that you need to back up, you can look to the larger drives. Prices generally scale with capacity in a mostly linear fashion these days, so you don't need to be too worried about being gipped if you buy the largest capacities available.

AFFORDABLE PORTABLES



Buffalo MiniStation Lite 500GB

Compact and easy to use.

@ www.buffalotech.com ✓ It's cheap and compact. ✗ Uninspiring software and performance.

Buffalo's MiniStation Lite is a drive targeted at those who don't need the fancy features of the Extreme. It doesn't have the shock resistance or the hardware encryption, which makes it less secure and safe than its cousin, but also somewhat less expensive. It still comes with most of the same software, including Buffalo's Backup Utility and power management software to spin the drive down when not in use. It's not software that's going to win this particular drive any converts and we wouldn't use it over the software built into Windows. Encased in smooth piano black (with a glowy Buffalo logo), the drive is a little bland, but it's compact and light enough to carry around in a pocket. The performance of the MiniStation Lite 500GB was also uninspiring, although for most practical applications you might not notice the difference.

Buffalo MiniStation Extreme 500GB

An aptly named drive.

@ www.buffalotech.com ✓ Shock-resistant, hardware encryption, top speeds. ✗ Weak software bundle.

It's not just the beautiful textured casing or the integrated USB 3.0 cable that make this drive 'Extreme': it's also the hardware encryption, extra speeds, the military-standard shock resistance and suite of included software tools. On the latter score, however, the less said the better. There's a backup utility, a RAM disk utility, a power-saver and TurboPC EX, which claims to improve performance, but made no difference for us. Not that it was needed – this drive hit it out of the ball park in our performance tests. The hardware encryption is useful. It prevents a lost or stolen drive from having its data hacked and ensures your data remains your own. You don't need to install anything on your computer, but there's a utility you can install that speeds up the login process on trusted PCs. Instead, you just run an executable utility on the drive itself to unlock it.

Hitachi G-Drive Mini 500GB (USB 2.0)

Does anyone still use FireWire?

@ www.hgst.com ✓ A unique look and cool carry case, FireWire support. ✗ USB 2.0 really hurts its performance for non-FireWire users.

We were taking bets on which would be the smaller Hitachi drive: the Slim or the Mini. It turns out the Slim won by a considerable margin. The Mini is large for a portable and heavy, being encased in aluminium. Its key virtue is that it supports FireWire 400/800, a dying interconnect standard that's still present on some older systems, especially Macs (it comes formatted in HFS for Macs). It has a USB connection, but it's USB 2.0. That really hurt it in our tests; like the other USB 2.0 drives in this roundup, it way underperformed the USB 3.0 drives. If you're a FireWire holdout, we suspect this drive has some appeal. The unique aesthetic and leather carry case are definitely attention grabbing. But if you're on a USB 3.0 or Thunderbolt computer, you'd probably best give it a miss.

Hitachi G-Drive Slim 500GB (USB 2.0)

Slim, but very slow.

@ www.hgst.com ✔ It *is* slim. ✖ It's USB 2.0 and therefore super-slow.

The G-Drive Slim is appropriately named. The super-slim drive might be a little larger in two of its dimensions than most drives, but it's thinner than any other portable drive we've seen. That's combined with a Mac-ish aesthetic, ensuring the drive will appeal to Mac users. Like other G-Drives, it comes HFS formatted for Mac users. Windows users have to reformat it themselves. It still uses USB 2.0, which caps its performance at the 20-30MB/s mark, depending on your computer. And unlike the G Drive Mini on page 63, it doesn't have the virtue of FireWire to fall back on. Without good performance or notable PC software, the Slim's only real value for PC users is its aesthetic. For some people, that might be enough, but most PC users should probably look elsewhere.

LaCie Rikiki 500GB

Elegant design and a nice price.

@ www.lacie.com/au ✔ Elegant design, solid setup and software. ✖ Middling performance.

The LaCie Rikiki uses the simplest design imaginable: a sharp-edged rectangle of brushed black aluminium and yet it really works, showing that once again LaCie understands elegant design better than any other hard drive manufacturer. It's not just the design that works for the Rikiki, however. Like other LaCie drives, you go through an initial drive setup, which formats it for your operating system and optionally partitions it into a compatible FAT drive with system software, and a fast NTFS drive for storage. It also comes with decent backup software on the drive; it's not as good as the WD or Seagate solutions, but it's a step up from Windows Backup, especially in terms of flexibility and ease of use. The performance of the drive is middling. It's not a touch on the Buffalo MiniStation Extreme or Seagate Backup Plus, for example, but it comfortably outperformed a number of other drives. For the bargain basement price that the Rikiki sells for, this isn't a bad deal at all.

Seagate Backup Plus 500GB

Extremely fast with great backup.

@ www.seagate.com ✔ Great backup software, blazingly fast. ✖ None. Really.

Whatever Seagate is doing to make its drive go fast, it's working. Like its 1TB compatriot in the super-sized portables group, the Backup Plus 500GB left nearly every other drive in its wake when it came to our performance tests. In fact, this was the fastest portable drive we've tested. The good doesn't stop there, however. Seagate's revamped backup software is a pleasure to use, a solution that not only manages to back up your PC, but will also go online and grab photos from your Facebook and Flickr profiles, and back them up for posterity. It's still not at the level of, say, Acronis True Image Home, but for those who want a very simple backup solution, it's a winner. The drive's aesthetic isn't dissimilar to that of the LaCie Rikiki, which is perhaps not surprising now that Seagate now owns LaCie. It has similar brushed aluminium, with curves instead of hard edges.

Verbatim Mobile Hard Drive 500GB (USB 2.0)

Slow, but at least it looks good.

@ www.verbatim.com.au ✔ Really compact and a looker, too. ✖ It's USB 2.0, no real supplied software.

Before we even plugged it in, we knew the Verbatim Mobile Hard Drive was in for a pasting in our performance tests. It's one of the few USB 2.0 holdouts still widely available and quite simply, USB 2.0 just can't compare with the new USB 3.0 standard. And so it was, with the drive performing on par with the Hitachi USB 2.0 drives, but way, way behind the many USB 3.0 drives in this roundup. It's a shame because Verbatim has a knack for building super-compact, highly attractive drives. With a similar glossy piano finish to the Store 'n' Go 1TB, it manages to be a size smaller than the competition. The Mobile Hard Drive is about the size of a smartphone and weighs just 140g. There's not much supplied software apart from a turbo USB driver that allegedly increases performance, but did nothing for the drive in our tests.

$99

7/10

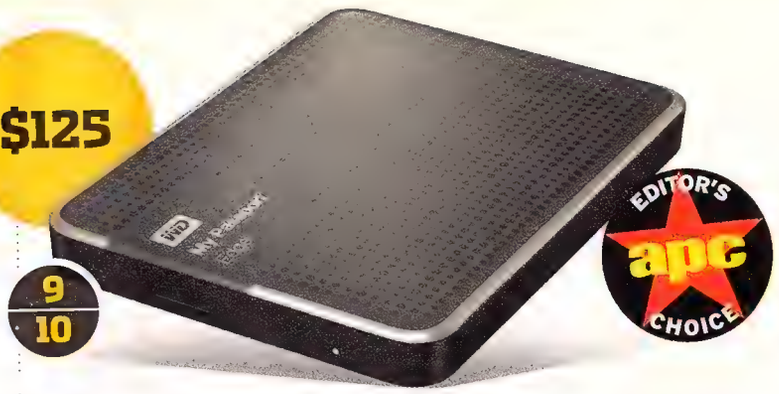
Western Digital My Passport 500GB

Excellent software and cheap.

@ www.wd.com ✓ Excellent software. ✗ Crummy performance.

Not as sleek as the new Edge series, the My Passport (formerly known as My Passport Essential) isn't without considerable appeal. Sure, it's a little chunkier than the Verbatim Mobile Hard Drive and the design's quite bland, but it's what inside that counts, right? And like all WD drives, it makes a good case for itself with the supplied SmartWare software used for drive security and backup. We like the software – it's not as sophisticated as third-party tools, but it's so easy to use that it puts many other solutions to shame. It's continuous rather than scheduled, backing up new files as they're written and existing files the moment they're changed. You won't lose a minute's work. Unfortunately, it's not enough to put this over the line against the Seagate Backup Plus, which also has excellent software. The performance of the My Passport was downright disappointing: the Seagate Backup Plus and the Buffalo MiniStation Extreme nearly doubled it in the sustained read and write tests! For some people that won't matter, but it's a clear indication that WD needs to work on its hardware more.

$125



9/10

Western Digital My Passport Edge 500GB

Brilliant performance at a great price.

@ www.wd.com ✓ Excellent software, hardware encryption, fast. ✗ The design is a little bland.

Hot off the WD production line is the Passport Edge, a new line of drives that includes both the excellent SmartWare backup software as well as hardware encryption. We've waxed lyrical about SmartWare in the My Passport review (left) and this is the same excellent software, providing continuous backup of your important data. Hardware encryption keeps your files safe in case you lose your drive or it gets stolen. When it's turned on, nobody can unlock the files on the drive without the proper password. The Edge is a little slimmer and lighter than its My Passport sibling and it has a new coat of paint that we're not totally sold on, but at least it's different. However, it's not just the outward appearance that has changed. The internals have clearly had a revamp, as the Edge blitzed the My Passport in our performance tests and edged (no pun intended) quite close to the performance of the Seagate drives. It's a vast improvement and given that the Edge is superior in every way, we wonder why the My Passport is still around.

SUPER-SIZE PORTABLES

$115

8/10

Hitachi Touro Mobile 1TB

More storage for less.

@ www.hgst.com ✓ Super cheap for the capacity, but you wouldn't know it to look at it. ✗ No real software provided.

Almost universally, Hitachi drives are priced a rung or two below the competition. We don't know why that is, but there's no question that many Hitachi drives make for great bargains. The Touro Mobile 1TB is no exception. Available at street prices of less than $100, the Touro Mobile provides more GB per dollar than any other drive tested here and that includes desktop drives. You give up something for that value, however, and in this case it's software. You don't really get anything on the drive itself and the package we tested only came with a card directing us to go to Hitachi's online cloud storage service and download backup software from there. This software works for both local and cloud backup, but is relatively uninspiring. The drive is built with a lovely metallic and black finish, and its performance in our tests was close to the mean among the larger portables we tested. It was well short of the Seagate drives and Western Digital Edge, however.

$170

8/10

LaCie Rugged Mini 1.5TB

Tough as nails and a good performer.

@ www.lacie.com/au ✓ Tonka tough, tons of capacity. ✗ A bargain price.

If you like to treat your electronics equipment like it's a Tonka truck, the LaCie Rugged Mini might be just what you need. The drive is designed to be mistreated, with water resistance, military-grade shock absorption and massive pressure resistance. For some reason LaCie also felt the need to make it bright orange, so it may be able to double as a traffic cone on dark nights. The rugged casing comes with a price, however: the drive is rather more bulky than its competitors. But when it comes to the internals, it makes no sacrifices. It has decent performance and the same excellent setup routines and usable software as other LaCie drives. Thankfully, your wallet won't hurt for the ruggedisation of the Rugged Mini 1.5TB drive either. In fact, the LaCie is a bargain for its impressive 1.5TB capacity and is definitely a worthy buy for those who like to go off the beaten path.

$150

9/10

Seagate Backup Plus 1TB

Fast, with great software.

@ www.seagate.com ✓ Excellent software, very fast. ✗ None.

As with its 500GB counterpart reviewed in the affordable portable section, there's a tremendous amount to like about the new line of Seagate Backup Plus drives. We're talking great software, fast speeds and an elegant design. What more could you ask for? When it comes to performance, the 1TB Backup Plus was part of a small, elite group of drives that handily surpassed the 100MB/s mark when it came to both read and write speeds. For most people, those kinds of speeds will be indistinguishable from the performance of an internal drive. That makes it perfect for applications like Windows To Go. The consumer backup software is also top-notch, with simple controls, continuous backup and the ability to grab items from your social media accounts, or conversely, upload media to your social media services. It's a very polished drive all round and worthy of our editor's choice.

$120

6/10

Toshiba Canvio Basics 3.0 1TB

A basic, ho-hum drive.

@ www.mytoshiba.com.au ✓ Cheap. ✗ Very slow for a USB 3.0 drive, no software or other extras.

Toshiba isn't well known for its portable drives, but we managed to get hold of one of the brand's Canvio Basics drives for this review. And basic is the right way to describe this drive. It comes with no software, has the blandest design imaginable and extremely lacklustre performance. With respect to the latter, we ran through our battery of tests several times to ensure the results were right. Even though it's a USB 3.0 drive, its sequential write speed was barely better than that of a USB 2.0 drive and its random seek speeds were substantially worse than even the USB 2.0 drives we tested. Its read speed, at least, was on par with some of the USB 3.0 drives. Meanwhile, the only software on the drive was a discount offer for movie making software. If you want a backup solution, you have to provide your own. Which leaves price as its key virtue. And here it doesn't fare too badly. It can be purchased on the street for less than $100, which is a very good deal for 1TB. But if price is your primary criteria, we'd probably suggest going with the Hitachi Touro 1TB instead.

$145

8/10

Verbatim Store 'n' Go 1TB

A middle-of-the-road performer.

@ www.verbatim.com.au ✓ Super-compact and stylish to boot. ✗ Rough software solution.

As we saw with Verbatim's 500GB drive, it's a company with a real talent for compact designs. With the Store 'n' Go 1TB, Verbatim has managed to shrink its device down to the smallest size you could possibly imagine containing a 2.5in hard drive – not a millimetre is wasted. With the glossy black finish, it even manages to look good. The performance of the drive was middling in our tests, sitting in the centre of the handful of super-high-speed 100MB/s+ drives and the low-cost 60MB/s drives. It's certainly not a mark against it, but if you're looking for top speeds, this might not be the best choice. The drive comes with Nero BackItUp & Burn Essentials, a software backup solution that's frustratingly rough and incomplete, and not nearly as user-friendly as the WD or Seagate solutions. It's not awful, but it feels more like an advertisement for the full Nero product than it does a final and complete solution for backup.

Western Digital My Passport 1TB

Nothing special apart from the software.

@ www.wd.com ✓ Excellent software. ✗ Slow random seek performance.

One of the great decisions Western Digital made with its external drive product line was to include SmartWare with every drive it sells. As we've mentioned in the reviews of the other WD hard drives here, it's a great solution, offering continuous automated backups with an interface that even non-technical users can easily grasp. That's a key selling point for what is otherwise a drive without notable features. Even the design of the My Passport is featureless: a rectangular blob without flair or accent, although at least it's available in a variety of colours. It's a little slimmer than the 2TB drive, but not nearly as sleek at the Verbatim drives or even its own My Passport Edge. Its performance was kind of middling as well. Sequential read and write speeds hovered around the median for 1TB drives, but random seek speeds were disappointing. Not shockingly so, but it may not be the best drive for active use.

7/10

$150

8/10

$299

HIGHLY apc RECOMMENDED

Western Digital My Passport 2TB

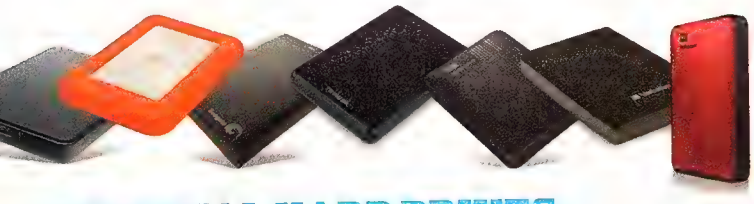
A generous amount of storage on offer.

@ www.wd.com

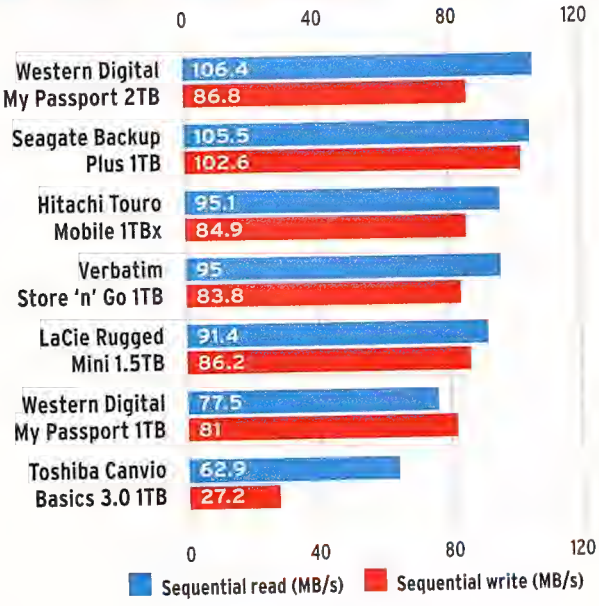
✓ 2TB, comes with excellent software.

✗ A little chunkier than the competition.

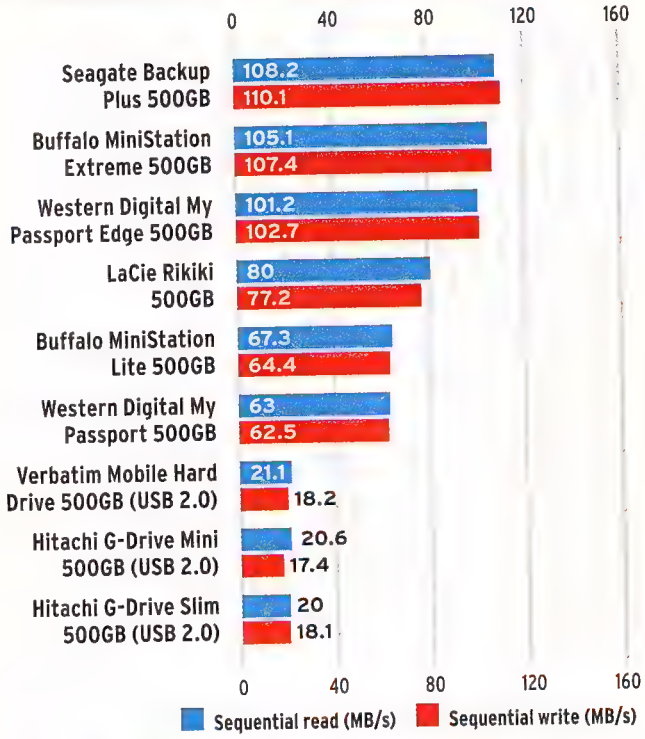
If capacity is your only criteria for a portable drive, no other device has more of it than the My Passport 2TB. With more than enough space to fully back up most desktop systems, it's an amazing achievement in a drive that relies entirely on USB power. To make this happen, WD had to use a slightly thicker hard drive and that's reflected in the size of the My Passport 2TB. It's not a beast by any means, but it's subtly thicker than the 1TB My Passport and most other portable drives as well. Its performance was certainly better than the other My Passport drives we tested, although WD's own My Passport Edge, the Seagate Backup Plus drives and Buffalo MiniStation Extreme all put in better benchmark performances. The My Passport 2TB is an expensive device, but on a cost-per-TB basis it's actually quite close to par with other portable drives in the 1TB+ range. And for some people, the ability to carry an entire 2TB in their pocket will be worth even more.

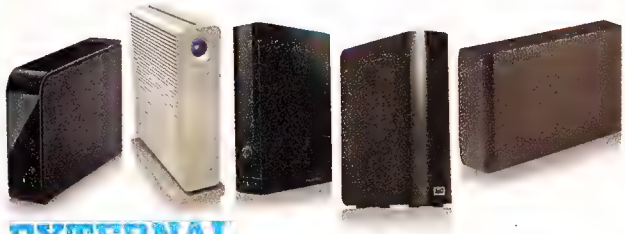


EXTERNAL HARD DRIVES: SUPER-SIZE PORTABLES

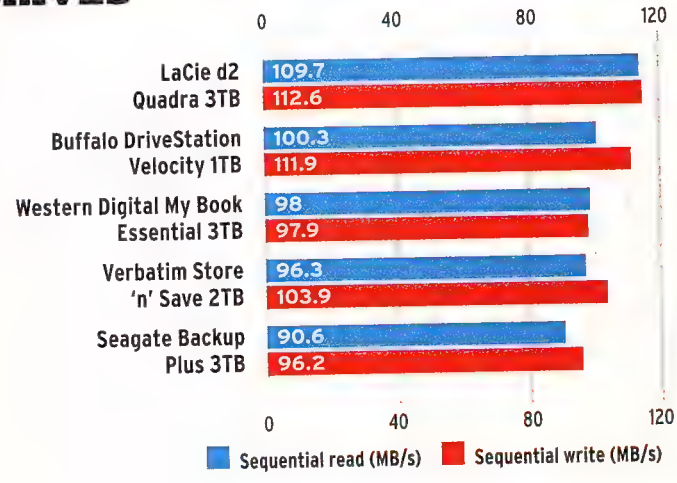


EXTERNAL HARD DRIVES: AFFORDABLE PORTABLES





EXTERNAL HARD DRIVES: DESKTOP DRIVES

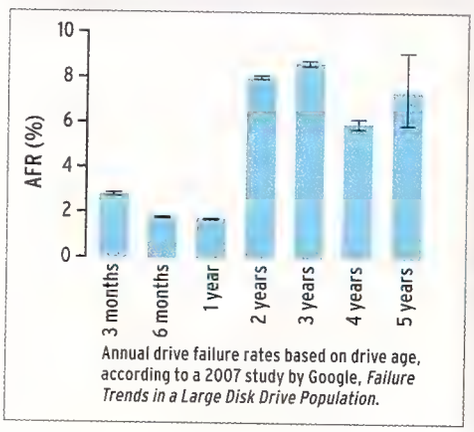


DESKTOP DRIVES

If you need more capacity than a portable drive can provide, you might consider purchasing a new desktop drive. Because desktop drives use larger internal hard disks than portables – 3.5in disks as opposed to 2.5in drives – you can get capacities up to a massive 4TB on a desktop drive. The price for that extra capacity is that you have to plug it into a wall socket because the USB port can't provide enough power to drive it. If the truth be told, desktop drives seem to be something of a dying breed. Squeezed between ever more capable portables and increasingly affordable NAS devices, the niche for desktop externals seems to be shrinking. Indeed, lower sales volumes seem to be resulting in higher prices, with desktop drives often costing more on a per-TB basis than portables.

HOW LONG DO HARD DRIVES REALLY LAST?

If you look at the packaging on just about any hard drive, you'll see a funny figure: MTBF or MTTF (Mean Time Between/To Failure). It's an official-sounding engineering term to represent the mean expected period before the hard drive will break down. And it's total bunkum. The roundness of the number is a dead giveaway. Most drives have an MTTF of a million hours or 114 years. So, according to the manufacturer, the drive has a 0.88% chance of failing each year. But drives don't really have an even chance of failing every year. Most commonly they have an 'infant mortality' period, with high failure rates in the first three months, then low failure rates for one or two years and increasing failure rates after that. A study by Google in 2007 (see **tinyurl.com/34v9x3t**) showed that annual failure rates hovered at around 1.7% in one-year-old drives, but shot up to 8% in two-year-old drives and 8.6% in three-year-old drives. The rates decrease a little after that; if it survives to three years, there's a good chance it will last another one or two because you've got a pretty solid drive. Naturally, high usage drastically increases failure, especially in the early and late years. Drives with high usage (like your system drive) have a failure rate several times higher than low-usage drives in the first year.



Annual drive failure rates based on drive age, according to a 2007 study by Google, *Failure Trends in a Large Disk Drive Population.*

$169

7/10

Buffalo DriveStation Velocity 1TB

The best choice for running an OS.

@ www.buffalotech.com

✓ Hardware encryption, good random seek performance.

✗ You can get a portable with similar capacity for less.

Smaller-capacity external desktop drives appear to have gone out of favour with most vendors and consumers as portable drives gain more capacity and become cheaper. The DriveStation Velocity is actually more expensive than several of the 1TB portables we tested, so we have to ask what the virtue is in a (relatively) low-capacity drive that you have to plug into the wall, rather than have powered by USB? Performance results. It didn't exactly blitz the portables, but the DriveStation was substantially faster than most, especially with respect to random seek times. If you're looking to run an OS from an external drive, this is a better choice than the others we tested. Like the MiniStation Extreme, this drive comes with a suite of tools: eco manager, backup utility, 'turbo' app and RAM disk application, none worth installing except the security manager. Like many Buffalo drives, the DriveStation sports hardware encryption.

LaCie d2 Quadra 3TB

Connection options abound.

@ www.lacie.com/au

✓ It connects to eSATA and FireWire as well as USB.

✗ We're not fans of the design.

Sometimes designs work, sometimes they don't. While we always respect LaCie's attempts to make its drives look different, in the case of the d2 Quadra, the design is a whiff. It's a good thing it has so much else going for it then. Quadra refers to the drive's connectivity options. Unlike Seagate, which forces you to buy add-on adapters, the d2 Quadra has four ports built in: two FireWire, one USB 3.0 and an eSATA port. You can use whichever is appropriate for your system. We tested it with the USB 3.0 port and it performed reasonably well. It delivered results better than any portable and was at least on par with most other desktop drives. Like the other LaCies tested here, the d2 Quadra launches with a partitioning tool, which will set the drive up for Windows or Mac, whichever you're using. It will also create a small FAT partition where key installers are kept. FAT drives can be easily read on most OSs. You can install the Backup Assistant and other provided software. It's not truly great, like the Seagate and WD solutions, but it's worth installing.

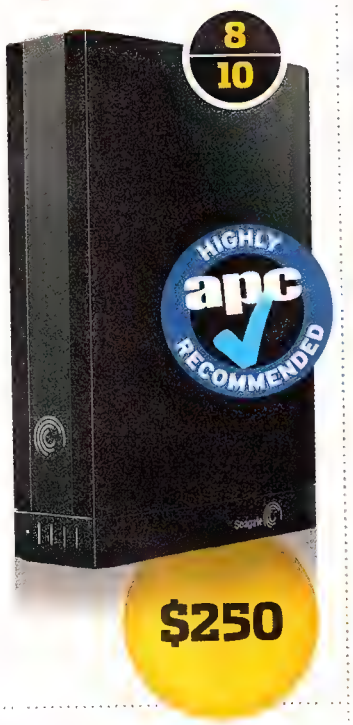
$350

9/10

Seagate Backup Plus 3TB

Offers plenty of storage for backups.

@ www.seagate.com | Excellent software. | Lacklustre performance.



$250

We were very impressed by both the hardware and software of the portable versions of the Seagate Backup Plus line. Would the desktop drive do as well? The software is the same excellent consumer backup solution found in the portables. It's not highly configurable like a commercial solution, but is extremely usable and has the ability to extract photos and other files from social media sites for local backup. However, the drive put in a lower performance mark than its portable counterparts in the sequential read and write tests. So surprising were these results that we had to test several times to be sure. If performance is your thing, you may actually be better off getting the portable drive. Of course, no portable (yet) has a capacity of 3TB on tap and that, combined with the quality of the software, means you might be inclined to overlook its performance deficiencies.

Verbatim Store 'n' Save 2TB

A little slower than most.

$169

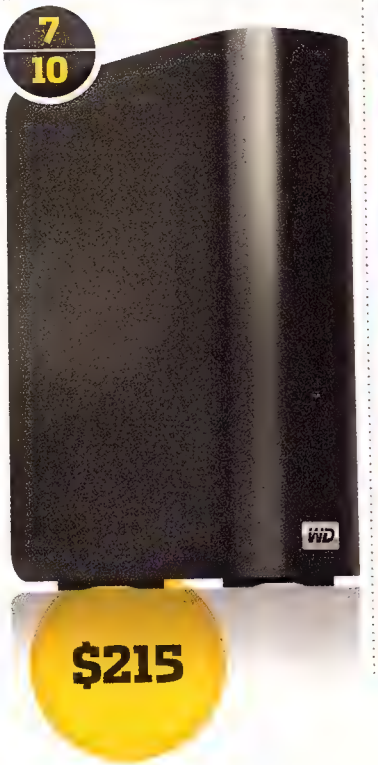
@ www.verbatim.com.au | A bargain for the capacity. | Lacklustre design and performance.

The designers who did such great work with Verbatim's portable drives were clearly on holidays when the Store 'n' Save desktop drive came up to the plate. Where the portables were sleek and shiny, the desktop drive is formless and blobby. But we guess nobody buys an external desktop drive for its looks. So how well does it perform? Well, the Verbatim once again proves the advantage that desktop drives have over portables when it comes to sequential reading and writing is minimal to non-existent, but their ability to perform fast seeks is substantially better. Relative to the other desktop drives, the Verbatim was a little on the slow side – only the Seagate was slower. The drive comes with two notable pieces of software: a utility for spinning the drive down when not in use and Nero BackItUp & Burn Essentials, a backup tool that's notably more sophisticated than both the WD and Seagate solutions, but also a little less polished.

Western Digital My Book Essential 3TB

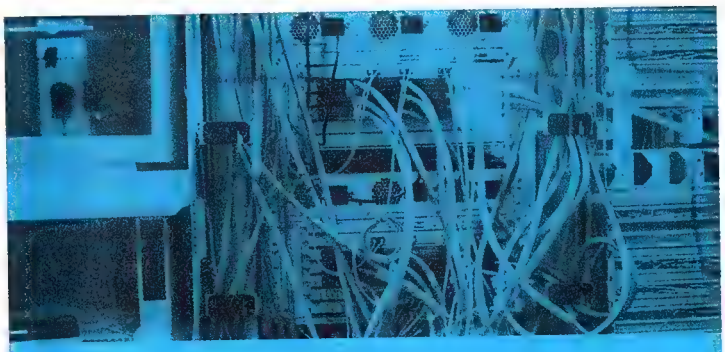
Saved by its excellent software.

@ www.wd.com | SmartWare is a winner, a good deal for the price. | Lacklustre performance.



$215

A product that's been on the market for quite some time now, the My Book Essential 3TB is still a serious contender. Its performance might be a little lacklustre and it might be a little on the hefty side, but it has a solid design built for side-by-side stacking and excellent supplied software. In our performance tests, only the Seagate really did worse and once again, we were shown that you don't really sacrifice any sequential read performance by going with a portable. Several portable drives outperformed the WD. But as we saw with so many of the other WD drives, the software is something of a saving grace. Using the same SmartWare as those other drives, you can perform very straightforward one-click backups of your system as well as get quick snapshots of the remaining capacity, backup sizes and file type mix.



HOW WE TESTED

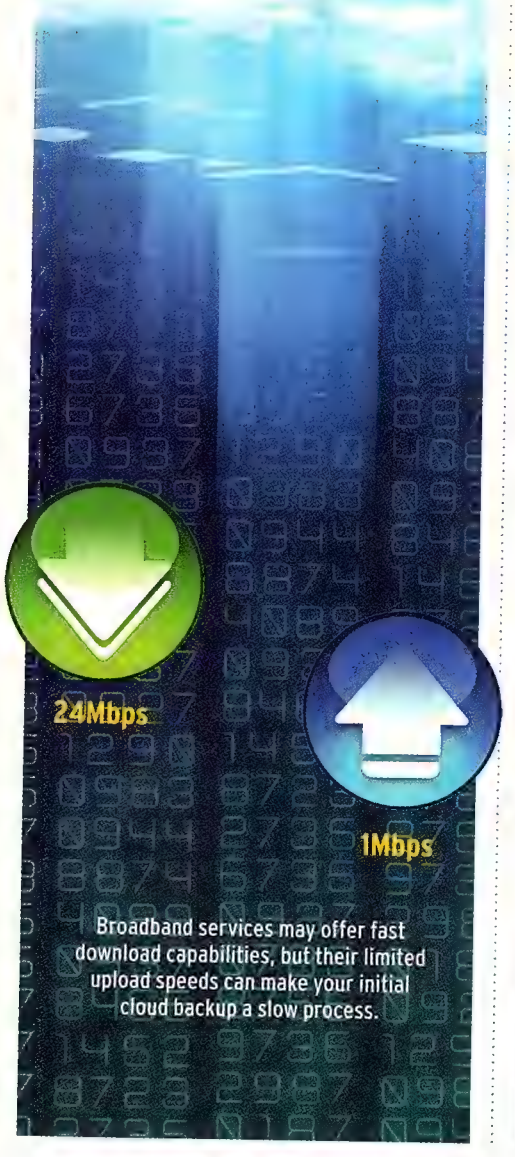
All the drives in this roundup were tested using PerformanceTest 7 from PassMark, a system-wide benchmark that includes a disk component. All the tests were performed on a Dell Inspiron 660s with an Intel Core i5-3450S processor and 6GB of memory. PerformanceTest 7 gives three disk test results, which we've published here. In all cases, the results are in MB/s and the higher the score, the better.

The first two tests are the sequential write and read tests. This reveals the drive's peak read and write speeds, and gives a good indication of how well the drive will handle large sequential file copies. If you plan to just dump a mass of files onto the drive, these will tell you how well the drive will perform in that situation.

The random seek test shows how the drive handles the much tougher task of having to jump from sector to sector in rapid succession. It's a better profile of how the drive should perform under constant usage conditions: as a system drive, for example, since a system drive has to keep calling different files from all over the drive platter.

Save it to the cloud

When it comes to backup security, nothing is better than the cloud. Nathan Taylor tests six of the biggest cloud backup services.



Broadband services may offer fast download capabilities, but their limited upload speeds can make your initial cloud backup a slow process.

Creating local backups of your important files is useful, but if you want maximum security, nothing beats the cloud. Cloud backup services allow you to upload your important data to them over the internet. The data is stored on remote, managed servers, so even if your house burns down or you have a massive synchronised failure of all your local backups, you'll still be able to recover your vital files.

Apart from being remote, however, cloud backup services work a lot like local ones. You install backup software (each service comes with its own backup program), select the things you'd like to back up as well as schedule backups, and then forget about it and let the service run in the background. If everything goes to plan, all your targeted files will be automatically and invisibly backed up without you ever having to think about it again.

There are downsides to cloud backup, though. The first is the cost. There are a few free sample services available, but they usually don't have enough capacity to make them useful for anything other than trial purposes. For most cloud backup services you're looking at $5 to $10 per month. Depending on the service, that may include a fixed amount of storage or unlimited storage.

BEWARE THE SPEED

The second thing you'll have to learn to deal with is the speed. Your first cloud backup will be a brutal experience. Most ADSL2+ services have a maximum upload speed of 1Mbps. That may seem like a lot, but when you're transferring gigabytes of data, it can take a long time to get through.

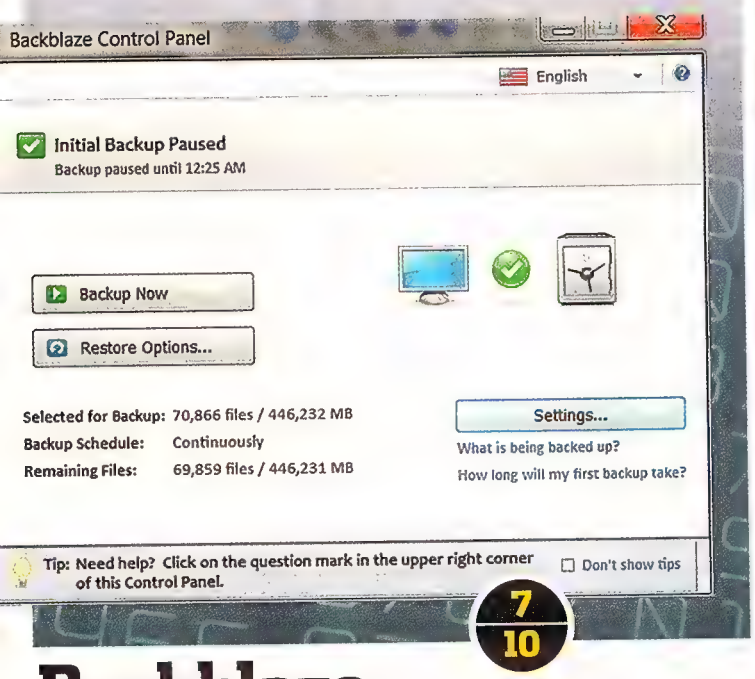
Even if you redline your upload link, it will take about 2.5 hours to upload 1GB and you'll get about 8-10GB per day uploaded. More practically, you'll likely get 2-5GB uploaded. This means your first backup may literally take weeks to finish. After that, things get easier. All the services use incremental backups, which means they only back up new and changed files. Unless you download new media like it's going out of style, subsequent backups are likely to be much more modest.

The other thing you have to think about is your monthly download quota, especially if you have an ISP that meters uploads. The initial backup can gut your quota and if you use a service with continuous backups, it may hit it hard on a monthly basis as well (if that's happening, you should switch to scheduled backups). Even if you have a high-volume cap, you might want to exclude things like videos from the backup, just to save bandwidth; in fact, videos are excluded by default on many cloud backup services. You simply should *not* use a cloud backup service if you're on an account that charges for excess usage, such as 3G accounts, because backup bandwidth usage can be very hard to manage.

If you've prepared yourself for the slow initial speeds and heavy bandwidth usage, cloud backups are definitely rewarding. They give you piece of mind that no local backup regime can match because even if the very worst happens, your data will be safe.

HOW WE TESTED

In addition to performing usability testing, we also decided to run some speed tests on the cloud services. On a fixed-line ADSL2+ account with 7Mbps download and 1Mbps upload, we first uploaded a 50MB file and then downloaded from the service. We used a stopwatch to time the transfer, from when the transfer actually started to when it finished, and then used that time to calculate the speed in megabits per second (higher is better). We've listed the speeds in the table on page 74. Internet speeds can be notoriously fickle, so take these results with a grain of salt – obviously, your mileage can vary drastically depending on the time of day, your ISP and myriad other factors beyond your control.



7/10

Backblaze

A one-click solution for no-limit full system backups.

US$5 per month, unlimited volume

www.backblaze.com

Super-simple, very reasonable price for unlimited data storage.

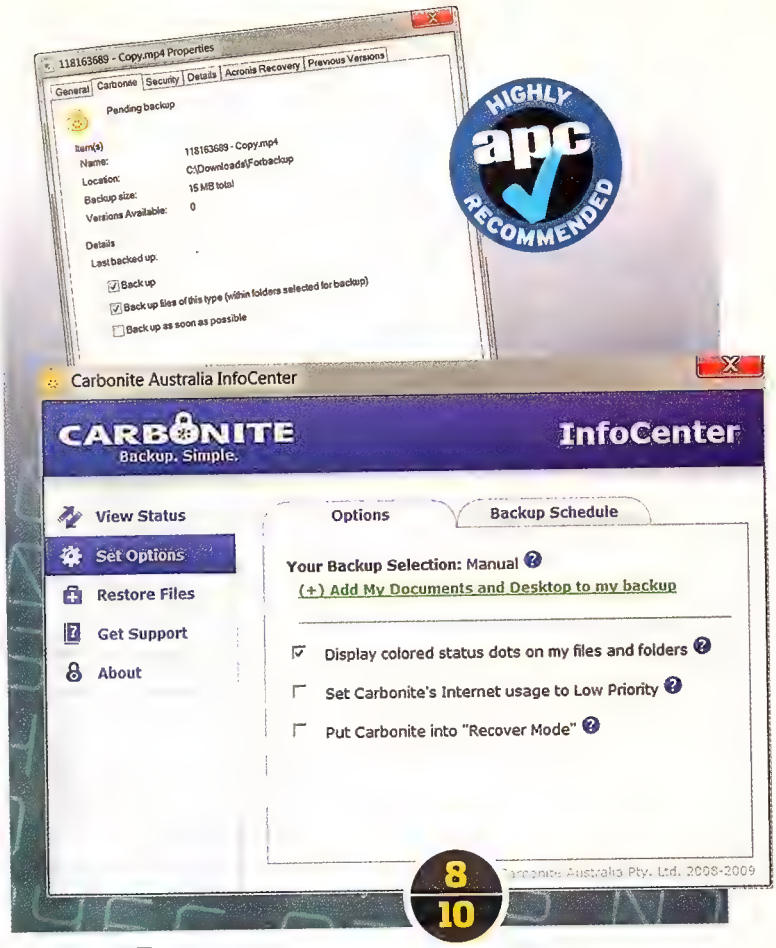
No built-in restore, file selection system is somewhat backwards.

A service for full-system backups, Backblaze keeps things simple. There are no limits on volumes, a straight US$5 per month charge and a very straightforward backup procedure. It's not a solution if you're looking for an accessible online drive into which you can write individual files and folders at will, but if you just want a one-click backup solution, this is a cheap and reliable method.

The software is designed to be extra easy for consumers. A set of strong defaults are in place and most users should be able to use them as is. Those who like finer controls might find they strongly dislike the Backblaze software, however. It uses defined exclusions rather than inclusions; for example, by default it will back up everything on the C: drive, barring things on the editable exclusion list, which includes executables, most movies and virtual drives. You can't point it at a specific folder and say 'back that up'. Backblaze also uses continuous backups. Whenever a file is created or changed, it's automatically uploaded to the backup service. If you find that it's grinding your internet connection, you can switch to scheduled backups and you can also adjust backup network priority in the Backblaze settings.

To restore files, you can log onto the Backblaze web site and download the backed-up files as a potentially massive .ZIP file. First you select the file you want to restore, then Backblaze builds a .ZIP file for you and then provides a download link for it. You don't need to install the Backblaze software, which actually has no restoration features. You grab the .ZIP file and replace the files yourself. That has the advantage of not requiring you to install Backblaze, but it makes restoring things like app data a largely manual process.

Backblaze keeps an archive of files for 30 days, so you can restore previous versions of files from up to four weeks ago.



8/10

Carbonite

Unlimited backups with excellent Windows integration.

$72 a year

www.carbonite.com.au

Excellent Windows Explorer integration, unlimited data, continuous or scheduled backup, local support.

Adding file types individually can be a pain.

One of the few online backup providers with Australian offices, servers and support, Carbonite also has the distinction of being one of the pioneers in the field of online backup. That experience makes for a very slick product, with voiceover help, wizards for setting up backup and restore, and a smooth, logical interface.

Carbonite lets you select individual files and folders for backup. The default settings back up most of your Windows user folder, but if you go to Windows Explorer you can right-click any file or folder to add it to your backup schedule. A little red dot on the icon indicates that it's in the backup group.

The Windows Explorer integration extends beyond that, too. When a folder is on the backup schedule, you can right-click it to see the backed-up version straight away. If you go into a file's properties you'll see a new 'Carbonite' tab; you can use this to add the file to the backup and include all files of that type in the 'include in backup' list. It's wonderfully intuitive and makes for a very smooth experience.

Carbonite supports continuous backup, monitoring the folders you've selected for backup and uploading any files that are added or changed. In Australian conditions, where we have limits on monthly volumes, you might want to change that to scheduled backups, given the bandwidth that it might require.

There are no limits on the amount of data a Carbonite subscriber can back up to the service, so you may as well back up as much data as your internet connection can handle.

Restoration is built into the Carbonite software, with a wizard that should get your system back up and running in the exact condition it was before in the event of a data disaster.

CrashPlan+

More than just cloud backup.

$35.20 a year for 10GB, $69.30 a year unlimited

www.crashplan.com

✓ Outstanding software for backup and restore, you can back up to other computers, easily create multiple backup targets.

✗ Doesn't scan your drive for files of a type.

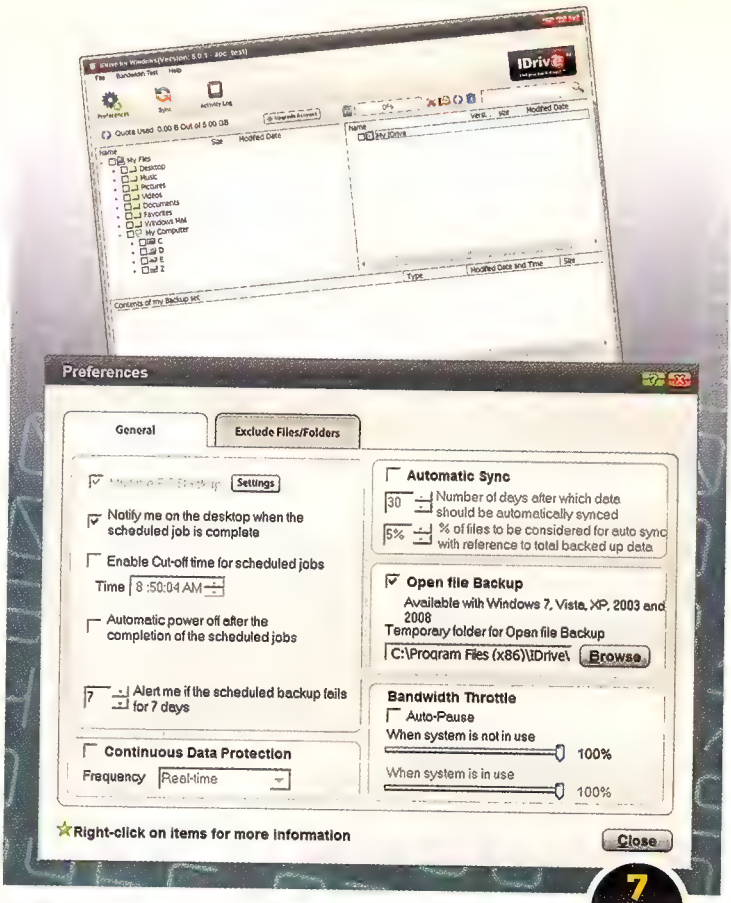
Another company with Australian servers, CrashPlan offers more than just cloud backup. The supplied software lets you set up a sophisticated network of backup targets and you can send your backups to multiple locations with ease. It's clever and perfect for those who want to hedge their bets. Even if you don't purchase the CrashPlan+ product (which includes cloud storage), it's worth downloading the free CrashPlan software for system backup. Backup targets include the cloud, network and attached drives, other computers you might own and the computers of friends who also run CrashPlan (you can also offer your computer to them so they can back up to you). Backup files are encrypted, so if you back up to a friend's computer, for example, they can't see your files.

Choosing what to back up is a simple matter of checking whatever folder you want to include in the backup. It's not sophisticated and it won't search your system for files of a given type, for example, but if all you wanted was folder backup, it's perfect. By default, your user folder will be selected. You can also choose file types to exclude, if you want.

Backups can be scheduled so they're near continuous, with new files backed up within 15 minutes of being created. Older files, including deleted files, can be kept in the backup archive indefinitely, or expire after a set period of time. You can rate-limit your backups, and CrashPlan can detect when you're at your computer and reduce bandwidth usage.

The '+' in CrashPlan+ comes from the online drive that's one of the potential backup targets you can use. For just $35 per year you can have a 10GB drive on those servers; for $70 you can have unlimited storage.

It's a very good deal on a service with tremendous appeal. The software design is elegant – the ability to automatically back up to other computers excellent and the CrashPlan service was as fast as any other.



IDrive

A solution that's a little retro, but works well.

Online Price 5GB free, US$49.50 a year for 150GB

www.idrive.com

✓ Simple for those who just want to copy selected folders to a cloud drive, supports multiple computer sources.

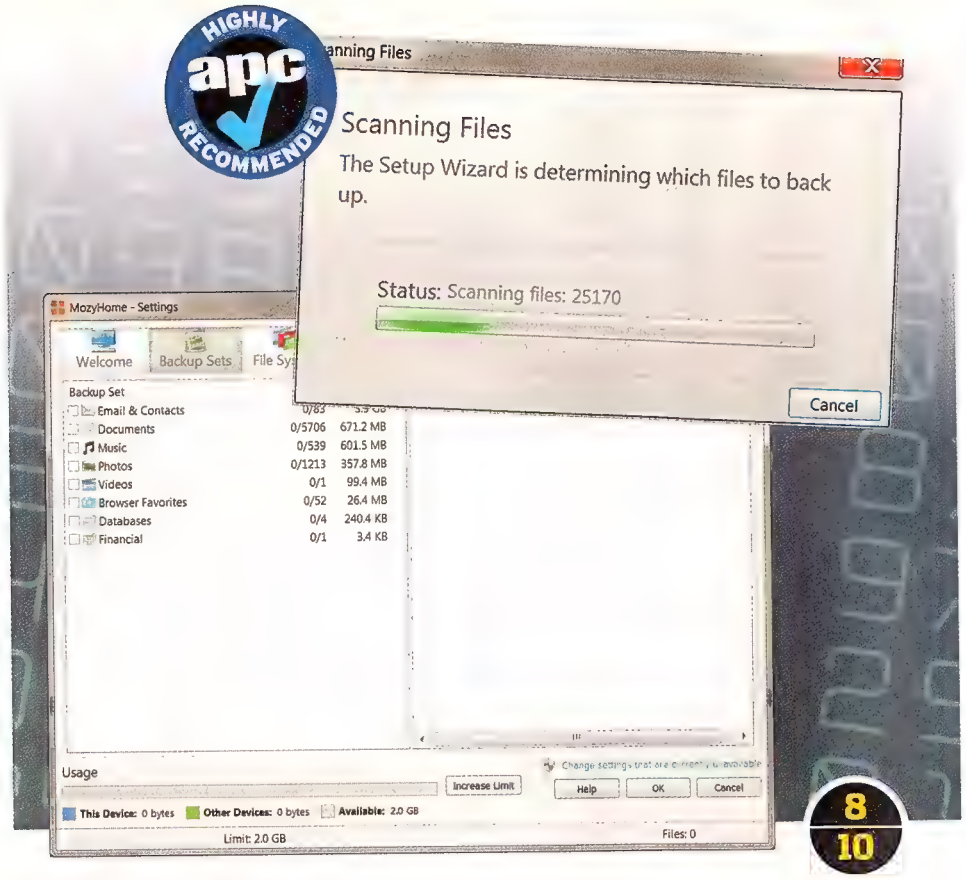
✗ Some poorly explained options, rough and retro interface.

Although at first blush it looks sophisticated, IDrive is actually relatively straightforward. Just select the files and folders you want to back up by checking them in the file viewer on the left and then let IDrive do its thing. If you want to restore files, look under the IDrive folder tree on the right and check the files you want to restore. It's quite straightforward, reminiscent of old-timey file copy tools.

It's when you drill down into the software that things get a little ugly, with some counterintuitive and poorly explained options. What's the difference between syncing and backing up? Why do I have a backup schedule if I chose continuous backup? Some simplification of the UI and better help could go a long way for IDrive.

IDrive offers a free account for up to 5GB. If you want more than that, you'll have to pay. On paid accounts you can set up multiple computers to back up to a single IDrive store; as long as you stay under your data limit, it's fine. Data from multiple computers is visible to all users, however – while each computer has its own subfolder, there's no user security to prevent anybody from seeing what's on the other computers. On the other hand, this can be used as a very convenient way to share large files between computers, since you can back up the file from one computer and then restore it to another. You can also share folders on your IDrive, which is another convenient way to send files to other people. You can limit shares to read only, set a password and set a maximum number of days or downloads for it to be available.

If IDrive could sand off the rough and retro edges in its software, it could have a decent service here. The simple source/destination structure works and sharing is cool, but the software needs to be better built for regular users to understand.



MozyHome & MozyFree

A solution that's among the easiest to use.

2GB free, US$65.89 a year for 50GB, US$109.89 a year for 125GB

www.mozy.com

Great for non-technical users, only uses bandwidth when you're away from your computer, supports a second local backup.

The software was buggy in our testing.

Our journey with MozyHome didn't get off to a great start. The software crashed almost immediately after we started it up. When we could get it to run, the initial wizard window was too small to actually see the backup selections and we weren't able to resize it. However, we finally managed to blast through the initial setup to the main application and as a result, we found a very good product.

MozyHome is designed for consumers, through and through. It will automatically search through the computer for selected file types to create backup sets, such as emails, photos and videos – the usual contenders. Just check any boxes for any file sets you want to include in the backup. If you prefer, you can use the 'File System' view and check any extra folders that you'd like to include in the backup.

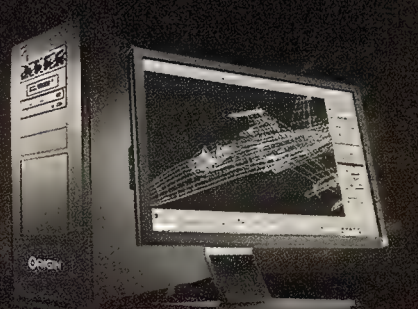
You can also change bandwidth and throttling settings, so that MozyHome only operates when you're away from your computer or it backs up according to a schedule. By default, it backs up automatically when you're away from your computer. Once you've set up the backup, Mozy disappears, working silently in the background.

Restoration works a lot like Windows Backup. You get a folder view of the files in the backup archive, you can check the ones you want to restore and either restore them to their original location or to a destination folder. You can search for files by name or date.

There really is a lot to like about Mozy. We love the way that it builds logical backup sets and gives you the option of adding full folders if you want to. You can use the same software to create an additional backup on a local drive and the backup bandwidth is designed not to interfere with your everyday use.

It could certainly use more options, like the ability to easily specify global file type exclusions. It would be nice if the software were a little more stable, too, and it would be extra good if volumes were a little higher for the price. But in terms of usability for consumers, Mozy has a leg up on the competition.

WHY DO THE CIA & FBI USE
ORIGIN
WE CAN'T TELL YOU, THAT INFORMATION IS..
CLASSIFIED


PCWorld 4.5 out of 5 Stars
PC GAMER EDITORS' CHOICE
EDITORS' CHOICE MAR 12 cnet
PCWorld 100 BEST OF 2011
MAXIMUM PC KICK ASS!
BUT WE CAN TELL YOU WHY NASA, THE AUSTRALIAN ARMY AND SWINBURNE UNIVERSITY OF TECHNOLOGY CHOOSE ORIGIN. IT'S SIMPLE. WE MAKE THE HIGHEST PERFORMING GAMING DESKTOP AND LAPTOP COMPUTERS.
ORIGIN
ORIGINPC.COM.A
1300 904 021

7/10

ZipCloud

The kernel of a really great service is here, but it needs more work.

$4.95 a month for 75GB, $5.95 a month for 250GB, $6.95 a month for unlimited

www.zipcloud.com

✓ A combination of syncing and backup service, web access to backups.

✗ Buggy interface with numerous UI flaws, limited backup and restore options.

ZipCloud is something of a messy fusion of backup service and Dropbox/SkyDrive-like syncing and sharing service. It certainly has potential, but the developers need to clean up the constant bouncing back and forth between the web site and local application, as well as some ugly interface flaws that make the product look unprofessional.

As a pure backup solution, ZipCloud is folder-based. You check the folders you'd like to back up in the folder tree view or drag and drop them from Windows Explorer. ZipCloud will then add them to the backup schedule. By default, it adds your Windows user folder. You can also add file type exclusions, although this option, like the folder tree, is actually buried in the settings. Scheduling can be set hourly, daily, weekly or monthly.

Restoration is a similar process to backup. Click on the 'Restore' tab, select the backup device and click a button. It's a very simple process, but it's virtually optionless.

On top of the backup service, ZipCloud also creates a sync folder, where you can drag anything and have it instantly uploaded. Much like Dropbox or SkyDrive, you can share this folder with other ZipCloud users or access it from other devices using your ZipCloud account. It works well enough, but it's not nearly as smooth or seamless as other similar services like Dropbox.

ZipCloud has a web view of backups, which you're abruptly taken to if you click on the 'My Files' button. This gives you a web view of both your sync folder and your backup. You can actually download files directly from this web page, if you've a mind. If you're away from home and need a file from your computer, for example, you could log into the web site, find the file and download it. It's nifty, but not enough to overcome the service's weaknesses.

SYNCING & SHARING SERVICES

The services reviewed here are dedicated backup services, designed to provide a complete, automated system backup over the internet. But what if you want something simple and light, a place where you can just store and perhaps share your photos and important documents? There are a ton of services that let you upload a modest number of files to an online cloud drive and access them from any device. They also let you share designated files with other users. They generally don't provide automated backup, although there's nothing to prevent you just copying your files to the synced folder.

- **ADrive (www.adrive.com)**. This is notable because it provides a full 50GB on a free account, more than any other online syncing and storage service. It has a similar set of features to SkyDrive and Google Drive, including online document editing and file sharing. Paid accounts add encryption to files, remove ads and allow massive file transfers.
- **Dropbox (www.dropbox.com)**. Dropbox creates a shared folder on your computer and anything you copy to that folder is automatically uploaded to an online storage account. You can access the files from any device with Dropbox installed or via your web browser. What's more, you can share directories on that drive with other Dropbox users, so when you copy something to a shared folder, it's automatically synced on that other person's computer. Dropbox is free with up to 2GB of storage, US$10 per month for 100GB and plans go up from there.
- **Google Drive (drive.google.com)**. Formerly known as Google Docs, Drive is an online productivity suite that lets you edit and share documents with other Google Drive users. It also makes a useful store for office documents, although it's less useful for other file types (Google also has Picasa for photos). 5GB is included with a free Google/Gmail account and larger accounts are available starting at US$2.50 per month for 25GB.
- **Microsoft SkyDrive (skydrive.live.com)**. Linked to your Microsoft account (used for Hotmail, Xbox Live and logging into Windows 8), SkyDrive grants you 7GB of storage on a free account you can use to store files of any type. SkyDrive also lets you very simply share files with other SkyDrive users, so it's great for sharing photo collections. As with Gmail and Dropbox, there's an app you can download to your PC that creates a virtual folder in Explorer – anything you copy to it is uploaded to your SkyDrive. You can increase your capacity at very reasonable rates, although you can't upload files larger than 300MB in size. As an added bonus, uploaded videos and photos are playable and viewable in a web browser and office documents editable online.
- **SugarSync (www.sugarsync.com)**. SugarSync is very similar to Dropbox, allowing you to store your files at a central site and sync them to various devices. It provides a full 5GB of storage on the free service, which is a substantial photo or document collection.

CLOUD SERVICES: HOW THEY COMPARE

	Plan 1	Plan 2	Plan 3	Upload speed test (Mbps)	Download speed test (Mbps)
Backblaze	US$5 per month, unlimited storage	US$3.96 per month for 2 years, unlimited storage	N/A	0.66	5.64
Carbonite	$72 for one year, unlimited storage	$130 for two years, unlimited storage	$168 for three years, unlimited storage	0.8	6.2
CrashPlan+	$35.20 per year for 10GB	$69.30 per year for unlimited data	$165 per year for unlimited data on up to 10 computers	0.82	6.3
IDrive	5GB free	US$49.50 per year for 150GB	US$149.50 per year for 500GB	0.69	6.1
MozyHome & MozyFree	2GB free	US$65.89 per year for 50GB	US$109.89 per year for 125GB	0.7	5.8
ZipCloud	$4.95 per month for 75GB	$5.95 per month for 250GB	$6.95 per month for unlimited	0.62	6

TECHlife AUSTRALIA

On sale now for only $5.49

Available on the App Store

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BUILD A HOME SERVER PC

PC guru Darren Yates takes your build requests and selects the best parts for the job.

SHARED MEDIA SYSTEM

Q I want to build a home server PC. The idea is to put all of my movies on the hard drives so I can access them with anything on my network – phone, tablet, media player, PC or notebook. I can afford $1,000 (so I'm told – don't ask!). Can I get something good for this price?

Dan Wheatley

Home servers are huge right now and it seems everyone wants one. It's also not surprising – with so many different digital gadgets, having your movies stuck on DVD isn't particularly useful. But the good news is it actually doesn't take much to make a decent home server. Personally, I'd consider using a Linux distribution for this, especially for something like simply streaming movies around your home network – its price to feature ratio is perfect – although Linux isn't for everyone, so we're going to have a look at a couple of options.

WHAT WE NEED

In terms of actual hardware, a home server is just a PC by another name – all we need to do is stack it the right way, with the features we need and none of what we don't. The key features here are network bandwidth, CPU performance and storage – lots of storage. We don't need much of a graphics card – it just needs to be able to output maybe to a big-screen TV. At worst, it means a cheap dedicated graphics card; at best, we could use the integrated graphics engine built into most current-generation CPUs. In terms of software, the OS is really all this system needs – if it's just a glorified file server, it won't need anything else. Obviously, the alternatives are that you can grab Linux for free or pay $99 for Windows 7 Home Premium, which affects the budget for the rest of the hardware. Let's start by assuming we're going to pay for Windows 7 and look at what options we can add if we go for Linux instead.

PROCESSOR:

INTEL CORE i5-3470 ($195)

Intel has been dragging the chain bringing out its cheaper dual-core Ivy Bridge processors. However, early pricing for the Core i3-3240 chip suggests it'll be around $170. At that price, it makes more sense to go for a quad-core Core i5-3470 instead, which is available for around $195. Those two extra cores will make a difference if straight, simple file serving becomes a full-on on-the-fly media transcoding box later on.

MOTHERBOARD:

GIGABYTE GA-H77M-D3H ($85)

This is a cracker of a motherboard with plenty of features for its tiny price: 14 USB ports (four of them USB 3.0) and six SATA ports; support for RAID 0, 1, 5, 10; plus integrated HDMI and DVI-D video output. And with the Core i5-3470 processor featuring Intel's HD Graphics 4000 engine, there's actually no need at all for a dedicated graphics card. The good news is that the GA-H77M-D3H still has twin PCIe graphics card slots for serious gaming, should you change your mind later. The board is also Gigabit network-ready. The only thing missing is wireless networking, but that's easily fixed.

HARD DRIVES:

3 X 2TB WESTERN DIGITAL RED WD20EFRX ($465)

Green, blue, black, red – it can be hard enough figuring out the different hard drives. Green-grade drives are low-power drives, designed for comfort rather than speed, but they're being retired so only old stock remains. Blue is the new Green, with the difference being that Blue drives run at 7,200rpm rather than Green's 5,900/6,500rpm, which means you'll get good general-purpose speed out of them. Black-grade drives are the Ferraris of the hard drive world and handle most PC applications really well.

However, we've gone with the new Red-class drives from Western Digital. They're designed specifically for NAS (network-attached storage) use, running 24/7, and a home server isn't that much different from a NAS box. They're fast enough, but we've really chosen these drives for reliability, which is what Western Digital

ASK US!

Looking to make your perfect PC, but not sure what parts to buy? Every month, our PC expert Darren Yates solves a reader's PC building quandary. Email us at contact@apctest.com for your chance to get building!

says they're aimed for. Three drives will give you 6TB of total storage in standalone mode or 4TB if used in a RAID 5 setup.

MEMORY:

4GB KINGSTON DDR3-1333 ($29)

If you're going to run a Windows system, you only need 4GB of RAM if it's just file serving. If you're feeling a bit exotic, one option you might consider is ramping it up to 16GB of memory (yes, the motherboard will take it), run 4GB for the OS and the other 12GB as a RAM drive. Provided your movies are all under 12GB, it should be possible to load the entire movie into RAM, allowing the hard drives to spin down, since once the RAM is loaded up, they're no longer needed. (This is only recommended if you know how to do this – we may look at how down the track.)

CASE:

THERMALTAKE V3 BLACK EDITION WITH 500W PSU ($80)

This is a good case at a decent price – it's not exactly lounge room friendly for a media centre PC, but as a home server, it's got everything you need: space, bucketloads of cooling and room for drives everywhere. I'm not a fan of its bottom-mounted PSU, but it'll do. Besides, more money spent here means less to spend elsewhere.

OPTICAL DRIVE:

LITE-ON IHES312 BLU-RAY/DVD COMBO DRIVE ($60)

Its highly unlikely you'll want to burn Blu-ray discs, but you might want to rip one or two, so this combo drive will do the job. The PC optical drive market is dying so there aren't too many options available, especially Blu-ray/DVD combo drives like this. If you don't think you'll be ripping Blu-ray movies, go for a straight DVD burner instead and save $40.

MONITOR, KEYBOARD, MOUSE, GRAPHICS CARD:

(NONE)

If you're serious about running this as a home server, you're won't need a dedicated monitor, keyboard, mouse or graphics card. As we mentioned, integrated graphics should be enough for our needs and for a file server, you only need a remote desktop setup using something like TightVNC (**www.tightvnc.com**) on both the server and your client PCs, and you'll be able to access the server remotely. Borrow a KVM (keyboard, video monitor, mouse) to set up the server, but after that, leave it on and access it via a client PC and your network. The idea is that once this is up and running, it should be out of sight and out of mind.

OPERATING SYSTEM:

WINDOWS 7 HOME PREMIUM OR UBUNTU 12.04 LTS 64-BIT ($99/FREE)

Your choice of OS will come down to ideological viewpoints, so I've given you both options. For basic file serving, the OS has everything you need. If you want to start getting extra features to turn it more into a NAS box, you can grab freeware apps online. But really, the only reason to choose Windows over Linux is if you're more comfortable with it. Ubuntu 12.04 LTS is the long-term support version, which means it'll be around and getting updates for the next five years. Go for the 64-bit version, especially if you might be tempted by a RAM drive later. ADC

TOTAL COST: ABOUT $1,015

We're a couple of coffees over the budget, but close enough that if you shop around, you could get it under $1,000 if you had to. If you choose to go with Ubuntu instead of Windows 7, the $99 saved isn't quite enough to buy another 2TB WD Red drive – at $155 each, they're not cheap. We reckon you could aim for an Nvidia GeForce GT 620 graphics card if the integrated stuff isn't doing it for you and keep the rest as change in your pocket.

You can also see how to build your own home server OS on page 84.

78 best apps

LATEST SOFT RE

Google Play

Weatherzone Plus

There *is* no other weather app.

$1.99 | Weatherzone | tinyurl.com/d7zsvpv

There are myriad weather apps available and in Australia, all source their info from the Bureau of Meteorology (BoM). However, The Weather Company employs a host of meteorologists to take the info from BoM (and other institutions) and funk with it, providing extra information.

As such, the Weatherzone Plus app provides a crazy amount of detail that eclipses the competition, with three-hourly temperature and rain probability forecast graphs for the next 24 hours (and tabular data for the next 48), and seven-day forecasts for minimum/maximum temperature, rain probability/likely amount and 9am/3pm wind.

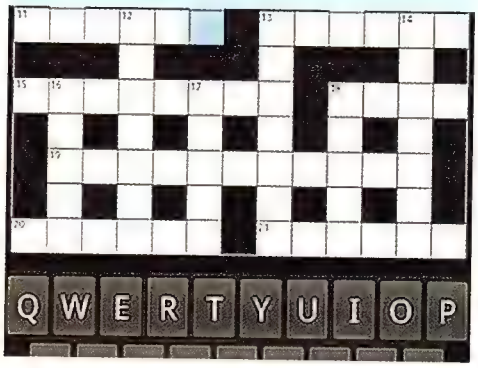
The app is not only information-rich, but visually gorgeous, with animated backgrounds and amazing visualisations, including animated radars and a lightning tracker.

Weatherzone also provides: an Australian synoptic map with rain areas and amounts for seven days (drawn by meteorologists every 12 hours); a national video forecast with cloud rainfall, wind streamlines, rain and forecasts; an interactive local radar animator and high-resolution state satellite and state/national radar domains.

Crossword

$2.99 (Lite version available) | Teazel Ltd | tinyurl.com/c8rjpux

There are some simple pleasures in life that I never grow tired of: cold beers on hot days, back massages, Sunday morning breakfasts (depending on my hangover, of course) and relaxing with a crossword puzzle. This app is my pick of the lot, not only because the developers spell things the UK way, but because the 250 included puzzles are created by 'professionals' (what do you study to become that?) and the interface is a pleasure to use.



Vignette

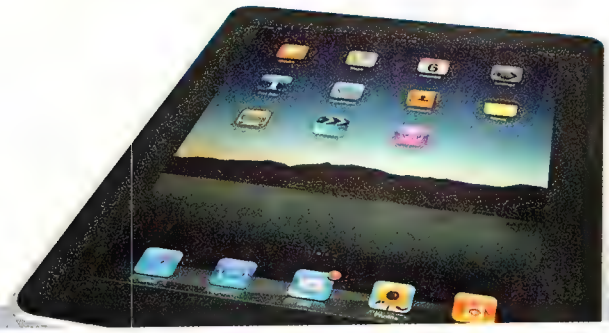
$2.95 | neilandtheresa | tinyurl.com/7wolbxj

Looking for something a little more effect-heavy than Instagram? How about your choice of 76 effects with 57 frames? Hefty. You can additionally cross-process, duotone, charcoal, tilt-shift, photo-booth and double-expose your images to really make 'em look special. It's also a full-featured camera app with support for full-resolution effects, flash, self-timer, digital zoom, geotagging, volume (or Bluetooth remote) as a shutter, composition guides and more – so you can safely stop using Android's default camera.

UberHype for Hype Machine

Free | Dirty Water Labs | tinyurl.com/d2o7btb

Hype Machine is a web site that trawls the blogosphere for hot music and allows you to browse and listen to it from a central place. UberHype is an unofficial Android client that allows you to do the same thing. Got a taste for something new from a particular genre? Use the tag browser to find something to scratch that musical itch. After something super fresh? Use the 'Latest' tab. Love the hype? That's what the 'Popular' tab is for.

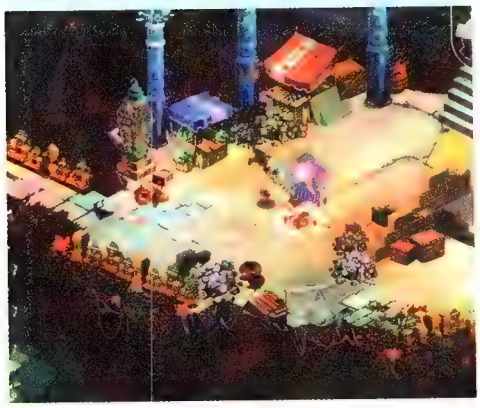


App Store

Bastion

$5.49 | Warner Bros. | tinyurl.com/ctemun3

Bastion, the award-winning PC and XBLA RPG, has been ported to the iPad (new and 2 only) with stunning results. The hand-painted graphics are beautiful, the score is top-notch and the gameplay is intuitive yet challenging. It even includes a narrator, who reacts to your actions. Thankfully, he's not even annoying. You have your choice of touch-the-place-you-want-to-walk-to style of control, or the more traditional gamepad style. Truly an RPG not to be missed.



Vintique

99c | GMY Studio | tinyurl.com/cdbvo55

Where Instagram tries to be as basic as possible, Vintique is really comprehensive and includes some fine-grained options – brightness/contrast/saturation, vibrancy, temperature/tint, highlight/shadow, gamma, exposure and hue – that will make your faux retro, double hipster filters really pop. This comprehensive nature extends to 32 filters, 19 vignettes, 49 frames, 26 textures and the ability to share to email, Instagram, Twitter, Facebook, as well as some other apps.

iBlast Moki 2 HD

$5.49 | Godzilab | tinyurl.com/c8gftg5

This sequel to the rather popular *iBlast Moki* does what a sequel should: it adds in some extra features, it increases the scope of the original (now 90 levels), yet maintains that special something that made the original so great. Like the original, it's a physics-based puzzler where you must build objects to help the Moki reach the magic spiral. It now introduces ability-changing paint bombs and other contraptions, as well as a level editor with shareable levels.

ParkPatrol

Avoid ticket terror.

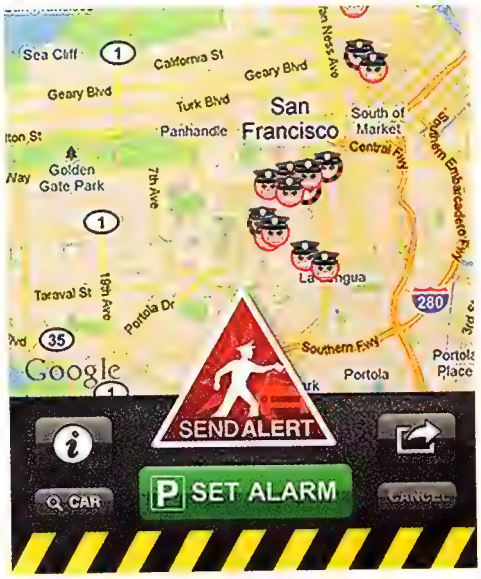
Free/$1.99 Pro | crwdpower.com | tinyurl.com/bt2wor8

While parking restrictions have their purpose, it still sucks to get a ticket. ParkPatrol is a crowd-sourced parking ranger detection app, developed by an Aussie company. When you park your car, you press the big green button to mark your location and then enter how long you're allowed to park for.

This makes a few things happen: most simply, it gives you an easy way to find your car again; handily, it also alerts you when your allowed time runs out (Pro only); and if you leave your car parked illegally, it will also alert you when there are parking rangers nearby.

The last part of this app is obviously the crowd-sourced bit I mentioned earlier. So, if you see any parking rangers about town, you're also expected to whip out ParkPatrol and plot their location. All of these reports are aggregated by the servers at ParkPatrol HQ and the alerts are pushed out to any at-risk users.

Obviously, this isn't a sure-fire way to avoid tickets, as the data will never cover every ranger in your city. The only way to be sure to avoid a ticket is to move your car when the initial alarm sounds.



Windows Store

Belts & Boxes

Who knew box factories could be so fun?

99c | Return True Studios | tinyurl.com/ccrpj6x

Physics puzzlers have seen a massive resurgence since *Angry Birds* did its thang a few years ago – not that this is yet another *Angry Birds* clone, but there are similarities, such as the three-star rating system. However, the stars are based on collecting three strategically-placed stars within the level, not on different achievements.

The object of the game is to move a box onto a platform. Your only means of moving the box lies in the various conveyor belts placed in the level. You can control their direction and/or speed – high-speed belts will fling your box across the screen, whereas low-speed belts will allow you to gently drop it onto the platform below.

There are 15 levels in each of the four stages and you can move onto the next stage only after you've collected 20 stars. Obviously, later levels introduce difficulties, including timed belts, slippery platforms and blocks that can... block... your path or lock off access to stars when you don't use the belts correctly.

Thankfully, a restart is only a touch away, so you needn't get upset. Additionally, if you get really stuck, every level has the option to be skipped anyway.

All in all, *Belts & Boxes* fun, simple puzzler that will surely keep you entertained on those long commutes.

Nova

99c | Jeffrey A. Voigt | tinyurl.com/c8c3r8v

The basic premise of this strategy game is to add mass to stars by tapping them until they eventually grow into supernova (this'll take three taps). When a star explodes, it shoots out mass in all four directions and each time one of those weighty globules touches another star, it adds a tap, opening you up to combos. Up to four pass-the-phone players can have their fun, or if you're low on friends, you can play the CPU or any of the single-player challenges.

Challenge and defeat the (hornet) AI in a battle for the galaxy

gləək!

$2.49 | Liquid Daffodil | tinyurl.com/ct73syl

gləək!, if you can forgive its untypeable name, is actually a great, attractive Twitter client for WP7. Some of the handy features include colour coding of your favourite Twitter users' tweets, a random tweet button (this is a surprisingly addictive feature, actually), live tiles, the ability to temporarily mute noisy users, multiple account support, customisable font size and themes, support for 'text effects' (like in the app name), inline image viewing and more.

Central Search

99c | CodeView | tinyurl.com/d9y36kh

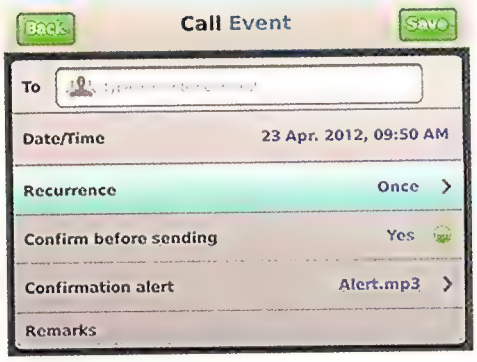
Central Search takes 19 of the most common places to search for stuff on the web and brings them into one app. Providers include: Amazon, Answers, AOL, Baidu, Bing, CNN, eBay, ESPN, Facebook, Flickr, Google, IMDb, Picasa, SoundCloud, Twitter, WebBrowser, Wikipedia, Yahoo and YouTube. Best of all, when you've found what you want – whether it's a page or image – you can easily share it over Facebook, Twitter, email, SMS and so on. Never be left wondering again.

App World

Future Scheduler

US$1.99 | Appsicum | tinyurl.com/c4bf5ou

This handy app allows you to schedule text messages, emails, Facebook/Twitter status updates and even phone calls for future dates. I often find myself, in the wee hours of the night, thinking of interesting questions to ask people in my life. Now, rather than waking my BFF at 4am to find out if they're for or against beetroot, I can set the message to send at a much more palatable (daylight) hour. In this sense, Future Scheduler not only schedules messages, it also saves friendships.



StereoTube for Playbook

US$2.99 | Andrei Avram | tinyurl.com/8jd4ucf

Why fork out for a monthly subscription to a music streaming service when there are plenty of free ways to listen to music online? YouTube, for example, is a veritable goldmine for the maddest beats, although its playlist creation isn't great for tablets. StereoTube, however, gives YouTube an interface that's more like a music player, which includes playlist creation and modification, shuffle and repeat functionality, and of course, search.

iTunes Sync

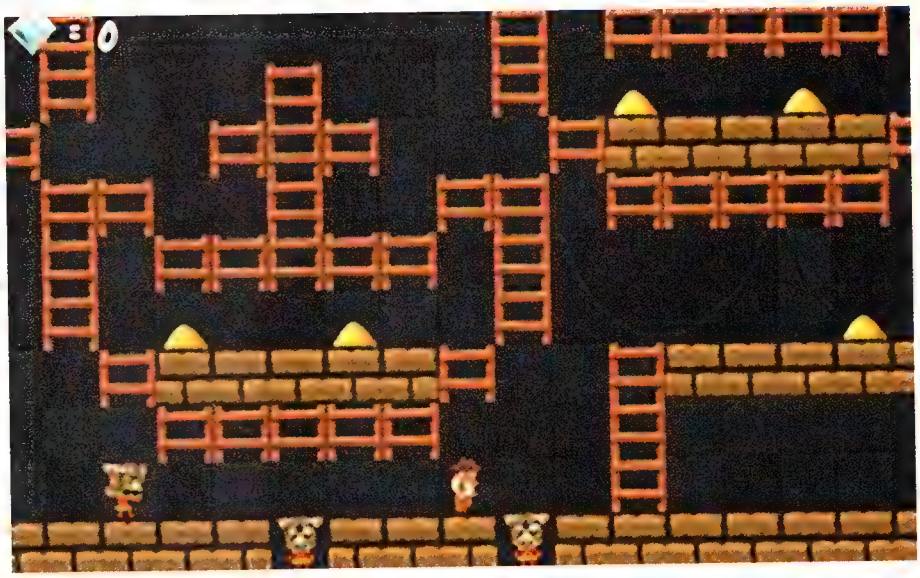
US$3.99 | Daniel Bigham | tinyurl.com/9mao6n7

While you may or may not be fond of Apple, it's difficult to ignore the reach of iTunes. It is, after all, the world's biggest music store. So, if you purchase your music through iTunes, you're probably looking for a handy way to transfer that latest One Direction single collection. iTunes Sync, coupled with a PC/Mac companion app from **tinyurl.com/d9uwhww**, gives you one-touch (and one-way) sync of your iTunes library to your BlackBerry device. It could only be easier if you owned an iPhone.

Lode Runner: the Legend

Retro fun on your retro handset.

Free | Avko Labs | tinyurl.com/d7hbul2



If you can cast your mind back to 1983, between Men at Work and driving VH Commodores, you may recall a little gaming title called *Lode Runner*. A few years ago, it was actually voted by Gamespot as the best game of all time and now you can play a touching tribute to it (with improved graphics and new levels) on your BlackBerry device.

For those who missed the original *Lode Runner* boat, the idea is that you're some kind of underground treasure hunter, choosing to search for treasure, not in ancient and abandoned caves, but in caves filled with guards. What made the original game so enthralling was the way that the guards move – almost unpredictably. This means you need to either run away from them, dig a hole to trap them, or kill them. In general, don't let them get in the way of your gold collecting.

All up, it's a nice remake of a classic game, with 50 levels (a third of the original and no level editor, but I'll overlook that), retro graphics and that unmistakable stink of nostalgia. Best of all, it's free. atc

Experts solve your computing problems

APC and its readers can be one giant helpdesk. If you have a technical problem, chances are one of us can solve it.

INTERNET

INPRIVATE BROWSING IN INTERNET EXPLORER

Q What exactly does the InPrivate mode do in Internet Explorer 9? I'd hoped it would help the pop-up blocker, but it doesn't seem to do anything extra.
Bruce Alexander

A Internet Explorer's InPrivate Browsing option allows you to surf the web without leaving any traces of where you've been. Cookies can't be stored on your PC by web sites and no record of the sites you visit – including forms filled in and usernames and passwords entered – is stored on the PC itself. The quickest way to start an InPrivate Browsing session is to press Ctrl+Shift+P. When you're finished, close the browser window, secure in the knowledge that no traces of your activity remain.

SECURITY

WINDOWS SUPPORT SCAM

Q A few days ago, I foolishly fell victim to the Windows Support scam. The penny dropped in time for me to avoid giving my bank details, but they did have access to my PC for a few minutes. Since ending the call I've disconnected my PC from the internet and used my wife's laptop instead and have run two full checks using AVG and ZoneAlarm. I also checked Task Manager, but other than one potentially suspicious process (crss.exe), I've found nothing. However, I'm still concerned. Can you provide any other advice before I reconnect to the internet?
Mike Eaton

A We were reasonably confident that Mike's quick thinking meant the scammers hadn't done too much to his PC in the short space of time they had access, but it's always better to be safe than sorry and he was right to be cautious.

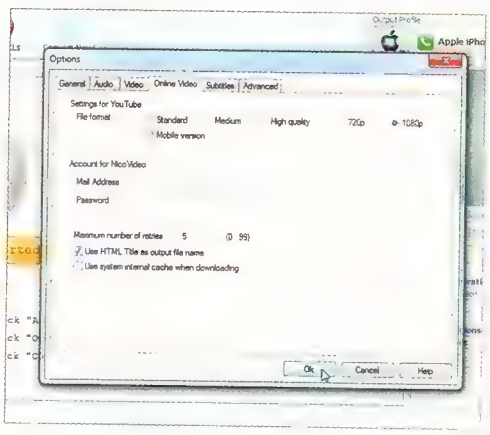
We instructed him to run a few more security checks with a scan and removal tool like Malwarebytes Anti-Malware Free (**www.malwarebytes.org**), but nothing was found. The crss.exe process is legitimate as long as it's the file found in Windows\System32 – it should have no username or description next to it, and right-clicking it and selecting 'Open file location' should have no effect. If it's found somewhere else then it's a Trojan, but Mike's security scans would have picked this up.

We reassured Mike that his computer was free from infection, but suggested he remain vigilant for a few weeks.

SAVE YOUTUBE CLIPS

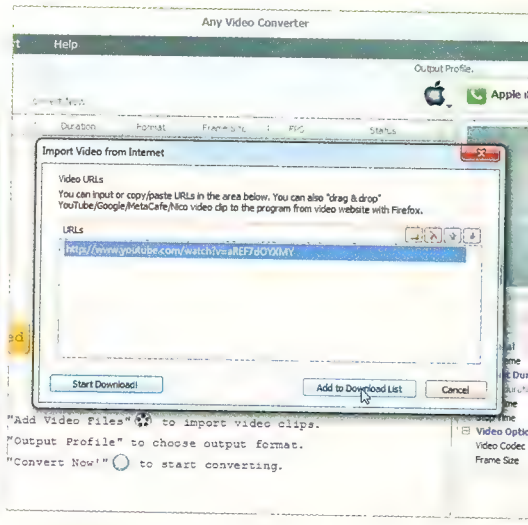
Q How can I save YouTube clips from the internet to my hard drive in WMV or MPEG format?
Kashif Ali

A You'll find the tool for the job at **tinyurl.com/374joh** in the form of Any Video Converter Free. It's important to stay on the right side of the law when downloading videos, so make sure you avoid copyrighted clips (like films, TV shows and music videos, for example) and don't share the files you've converted with other people either.



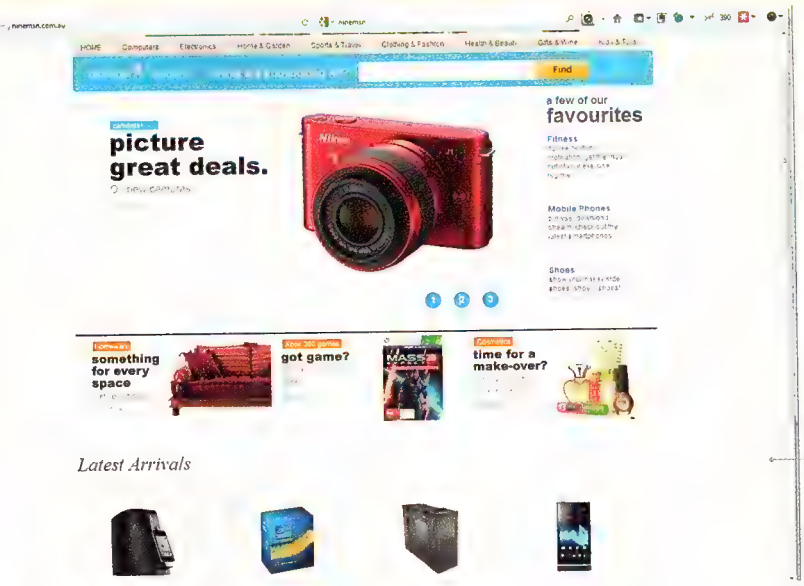
01 FIRST STEPS

Download AVC Free from **tinyurl.com/374joh**. Choose 'Custom installation' and untick the AVG boxes. Then go to 'Edit > Options', switch to the 'Online Video' tab, choose a quality setting and click 'OK'.



02 IMPORT VIDEOS

Open the web page containing your YouTube video. Select the URL in the address bar and press Ctrl+C. Switch back to AVC and click the 'Add URLs' button. Press Ctrl+V and click 'Add to download list'.



STAY HIDDEN: Keep gifts a surprise using IE's InPrivate Browsing option.

HARDWARE

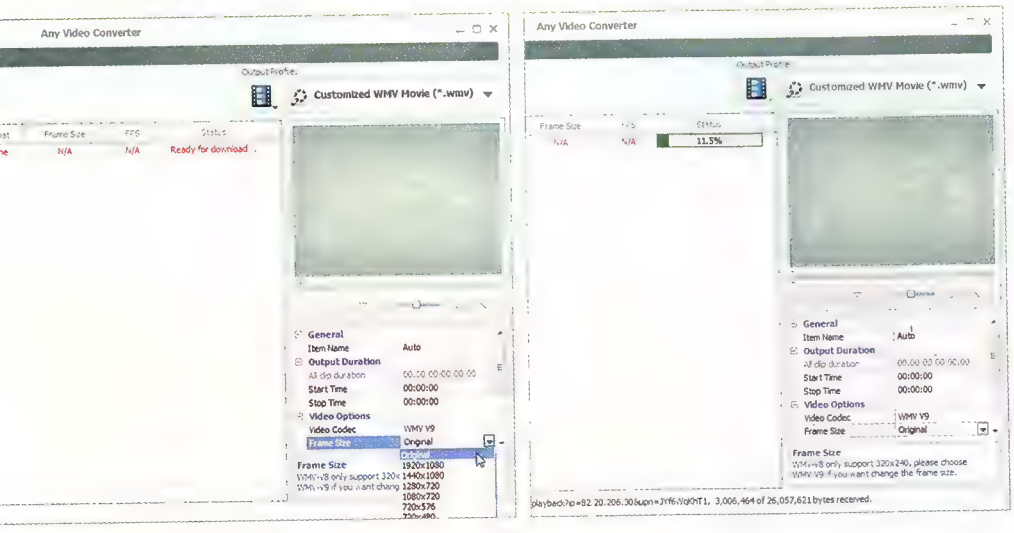
WINDOWS XP POWER-SAVING SETTINGS

Q In Windows XP, what's the difference between 'Turn Off' and 'Standby', and how safe is the latter option to use in terms of causing problems with programs, system files and so on? I'd like to use 'Standby' on a daily basis at work, switching off only once a week. In a similar vein, what's the difference between 'Shut Down', 'Sleep' and 'Hibernate' in Windows 7, and how often can they be used to speed up boot times?
Dr Mohammad Hajarat

A We don't recommend using 'Standby' for anything other than short periods of time in Windows XP – it's much better to power down the computer at the end of each day. Windows 7's power-saving schemes are far more efficient. In fact, 'Sleep' is safe to use overnight in some cases, as it's much more energy-efficient than 'Standby', and it means you can carry on working again in a matter of seconds instead of minutes.

In many ways, the new 'Sleep' mode renders 'Hibernate' obsolete. 'Hibernate' simply saves your memory to hard disk and then restores it in a similar manner to 'Sleep', except over a period of minutes rather than seconds.

One thing we do recommend, however, is that you power down your computer on a regular basis – leaving Windows running for extended periods of time without a proper shutdown and restart can eventually cause problems. Ideally, you'll do this on a daily basis, although if not, try to make sure you power down and restart at least once every few days.



03 CHOOSE OUTPUT FORMAT

Click the apple icon under 'Output Profile', select 'Video files', then click 'Flash video movie' and choose 'Customized WMV or MP4 movie'. Click the 'Frame size' menu and choose your desired resolution (or 'Original').

04 CONVERT & WATCH

The default output folder is My Documents\Any Video Converter. Go to 'Edit > Options > General' to change this if you want, then click 'Convert now!' and the video will be downloaded and converted.

QUICK QUESTIONS

How can I stop my laptop's touchpad from reacting every time I accidentally brush it when I'm typing?
Freya Saunders

*Either turn it off via the appropriate Function key or install the free Touchpad Blocker program from **touchpad-blocker.com**. Note that this tool is incompatible with AVG's antivirus programs, which mistakenly view it as malware.*

I've used Partition Magic to create two partitions on my USB drive, but Windows Explorer only sees one. Both partitions are visible in 'Computer Management'.
Jem Britcher

It sounds like Partition Magic hasn't formatted the second partition you've created. Right-click drive Z: in 'Computer Management', select 'Format' and the drive will be visible and usable in Windows.

After migrating to a new computer, I've discovered that my Microsoft Word icons have changed. What's the easiest way to correct this?
Paul Baker

*Go to **support.microsoft.com/fixit**, select 'Windows' under 'Select a problem area' and click the 'Run now' button next to 'Diagnose and Repair Windows File and Folder Problems Automatically'. This will download a fix-it tool that should resolve the problem.*

Is it possible to remove Windows Media Center in Windows 7? I never use it.
Graham Vine

You can't uninstall Windows Media Center, but you can effectively disable it. To do this, click 'Start > Default Programs > Set program access and defaults'. Expand 'Custom', untick 'Enable access to this program' next to 'Windows Media Center' and click 'OK' to finish the task.

CONTACT@APCTEST.COM
Share your tech tips

Have you solved a tech problem or found a better way of doing things with your computer? Share your information with other *APC* readers by sending it in as a tip to contact@apctest.com, together with your name and contact details (details won't be printed). Alternatively, if you have a technical question post it online on our forums at apcmag.com/forums and other readers may be able to solve it.

Make your own Windows home server OS

With news that Windows Home Server is no more, we show you how to spec up any Windows XP, Vista or 7 OS into a cracking home server operating system.

APC EXPERT

DARREN YATES

Darren is a multi-award-winning journalist who started building and testing computers in the early '90s. He's developed a range of PC software, including PC User's UserBench benchmark series starting in 2005, its UserOS Linux distros in 2008 and is now working on yet more benchmarks for *APC* when he's not busy writing or torturing hardware with his soldering iron.

Microsoft's decision to pull the plug on Windows Home Server (WHS) is interesting to say the least. It's decided to fold the OS into the new Essentials version of its upcoming Windows Server 2012. You can read about the move in the company's product PDF at **tinyurl.com/779nytz**. Basically, Microsoft reckons WHS saw best use among the SOHO environment and the 'technology enthusiast community'. So, rather than keep it going, it wants these users going for Windows Server 2012 Essentials instead – or at least that's how I read it.

There's just one slight discrepancy: you can still buy WHS 2011 for around $50 as an OEM disc from a number of local retailers on **www.staticice.com.au**. What's more, you'll still be able to buy it as a standalone OS disc until December 31, 2013, or as an embedded release until, incredibly, December 31, 2025.

However, if you read the new licence costs for Windows Server 2012 Essentials from **tinyurl.com/cyo33z4**, it's clear why Microsoft wants users going to Windows Server 2012 – even the Essentials version will cost you a cool $425. So clearly, it's time to start thinking about WHS alternatives.

Motherboards running a UEFI BIOS can't run Windows XP.

WHERE TO START

At this point, it'd be very tempting to say 'see you later' to Microsoft and latch onto one of the many free Linux distros that can be pressed into the role of a home server OS. I even developed a couple of UserOS Home Server Linux distros for *PC User* magazine over the last year or so. One thing that led me to develop those distros was the lack of alternatives – at least alternatives that didn't just rely on a command prompt. Running a typical Linux server OS with little more than a command prompt is almost a badge of pride among some Linux users.

But there's no reason a server OS can't have a desktop environment and equally, there's no reason why a desktop OS can't be pushed into a server environment if you add in the bits you need. So it raises the question: if you want to stick with Windows because it's easier to understand, can you press a Windows desktop OS into the role of a home server OS? The answer is very definitely 'yes'.

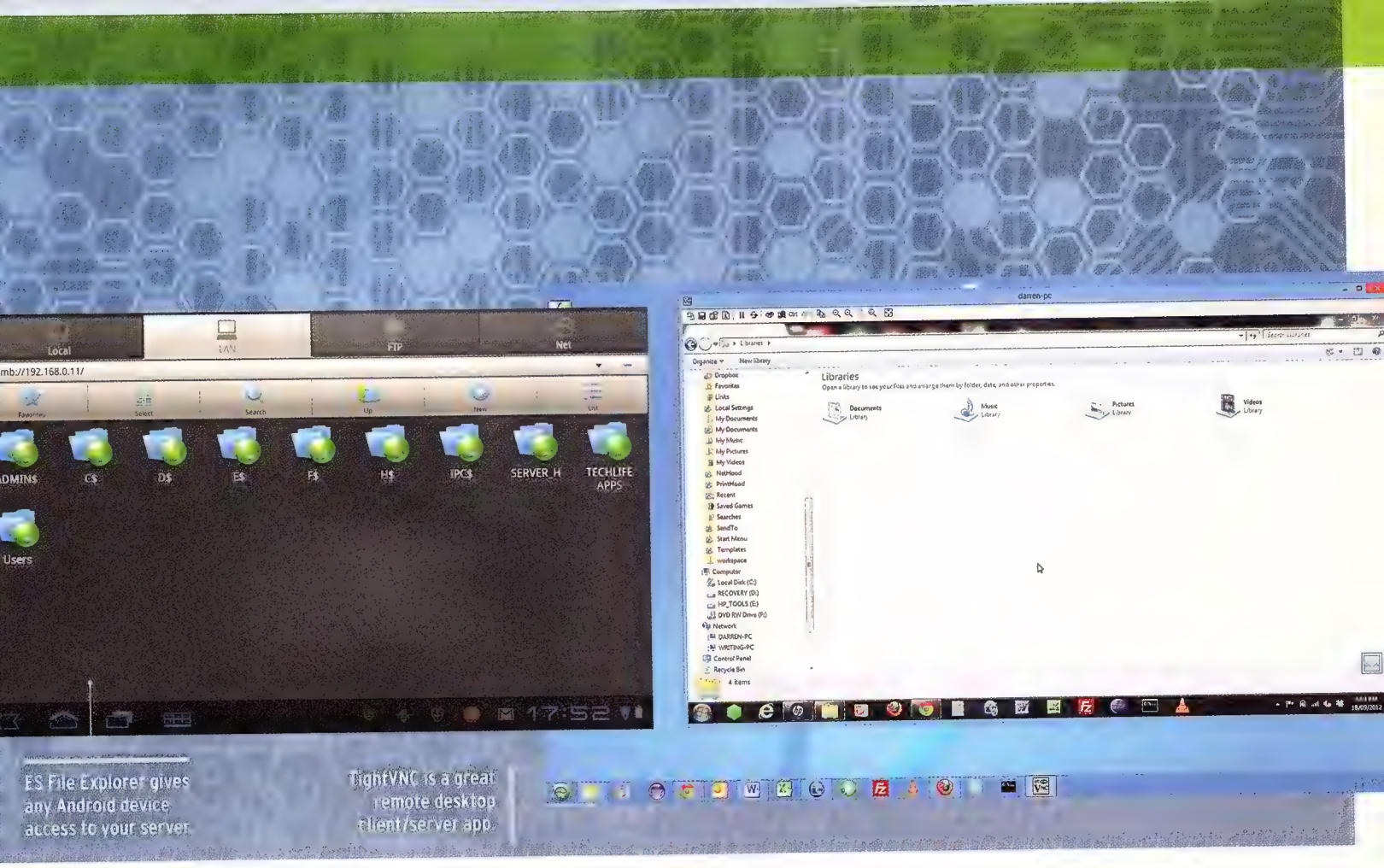
WHAT A HOME SERVER OS NEEDS

The simplest way to construct a home server OS build is to simply consider the functions you need it to perform. Everyone has different needs, so it's a case of looking at the specific function requirements, seeing what the desktop OS can already do by itself and supplementing it with free apps from the web, of which there are plenty. It's completely unorthodox, for sure, but if you have a decent Windows OS you're not using for anything else, there's absolutely no reason why you can make it work in a home server.

BASIC HARDWARE CONSIDERATIONS

Choosing your version of Windows as the base for your home server OS can't be done in isolation to the hardware you plan to use. If you're going to use an UEFI BIOS motherboard, for example, that rules out Windows XP and likely the RTM version of Windows Vista, too. Plan to use hard drives larger than 2TB and that knocks out Windows XP again.

A simple rule of thumb would be to use the version of Windows that matches the era of hardware you plan to run it on. For example, if you're using an older Intel Core 2-series PC, Windows XP or Vista should be fine; if it's a new Ivy Bridge-class Core i5 box, I'd choose Windows 7 to at least ensure it boots up.



NAS

I've always been impressed with the features list delivered by many of the home-grade NAS boxes from the likes of Synology and QNAP. They're quite extraordinary when you consider what these nuggetty little Linux-powered devices can do. So when designing my UserOS Home Server releases, I unashamedly looked to see how I could replicate as much of their functionality as I could.

I think it's no different if you're trying to do the same thing with Windows. Some features are easier to implement here than in Linux, while others are harder (or at least cost money to implement). If you take a look at some of the specs of home QNAP or Synology NAS boxes, there's a decent list of features you can replicate relatively easily.

So let's take a look at some major feature groups you'd expect any good Windows home server to have on board:

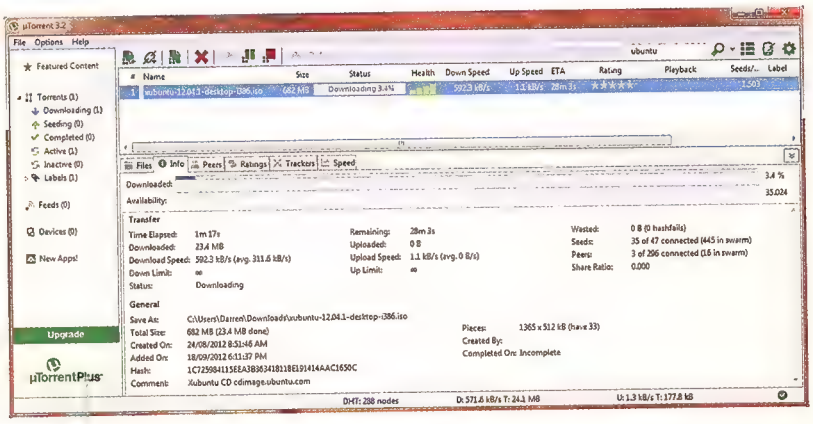
01 FILE/PRINT SERVING

Any Windows desktop OS can eat up file and print serving straight out of the box. You simply turn on file and printer sharing and create your share folder. Then, set up your printer, share it and that's about it. Printing from mobile devices isn't exactly easy and typically requires printer-specific apps from printer vendors, although accessing server folders from your mobile device should be fairly easy. On iOS, grab and download FileExplorer from the App Store; on Android, look out for ASTRO File Manager or ES File Explorer (both support network file access) on Google Play.

02 REMOTE DESKTOP

Normally, a server OS is remotely monitored via a web browser over the network. However, there's no reason why you couldn't simply implement a remote desktop setup. TightVNC (**www.tightvnc.com**) is perfect for this – it's free, comes as both server and client halves for Windows, has password access, and allows you to see and access the server OS over your network. Configure TightVNC's server to launch as soon as the server boots up and you can use it as a headless (no monitor) system.

If you're using Linux clients on the network as well, install Remmina (it's part of the Ubuntu repository, so just run **sudo apt-get install remmina**). It's a great remote desktop client and it'll connect via TightVNC on your Windows server, giving you control access.



uTorrent, a lightweight BitTorrent client you can use on a Windows server.

Obviously, running a remote desktop on mobile devices is a little more difficult given the typical screen size, but grab android-vnc-viewer from Google Play and it'll talk to your server's TightVNC setup.

03 BITTORRENT

It's one of the more common features you'll find in many NAS boxes these days and a BitTorrent server is something you can implement with your favourite client. Personally, I'd go for something lean and light like uTorrent (**www.utorrent.com**) so that it doesn't load down the server. Be aware that if you're running your BitTorrent client 24/7, it may affect other more CPU-intensive apps such as media and DLNA streaming, although that'll be more a function of the hardware platform you use. Most clients will run on anything from Windows XP up.

04 FTP SERVER

FTP (File Transfer Protocol) might seem old hat these days, but it's still a simple protocol to implement for moving files around and the easiest

way to set up an FTP server is to use something like FileZilla Server (**tinyurl.com/36zp7z**). It's free and runs on any version of Windows from XP Home Edition up. And it obviously couples up nicely with FileZilla's FTP client on Windows and Linux.

05 UPnP/DLNA SERVER

Music and video servers have become big business over the last couple of years, as everyone wants to view their content on anything but their PC screen. UPnP is just one of a number of networking protocols that makes this happen and it's a system of two halves: a server sending the media files, and a client receiving and playing them.

Just to make things slightly more complicated, many new TVs use a subset of UPnP called DLNA. Since version 11, Windows Media Player (WMP) features a built-in UPnP/DLNA server; in fact, it's the old Windows Media Connect feature added in. WMP 12 is the latest release, built into Windows 7 and 8. If you're using Windows XP as your home server OS, grab WMP 11 (**tinyurl.com/7n95wa8**) and you'll get UPnP server support.

Another free option is XBMC (**www.xbmc.org**), although for a server it's probably overkill, even though it has its own UPnP server built in. An arguably more suitable option is Llink (**tinyurl.com/25j2f4**). It's open source and has some good features including UDF2.50 support, so it'll handle basic single-layer Blu-ray disc ISO playback, along with standard DVD movie ISOs. It also has on-the-fly transcoding support.

06 AUTOMATED REMOTE CLIENT BACKUP

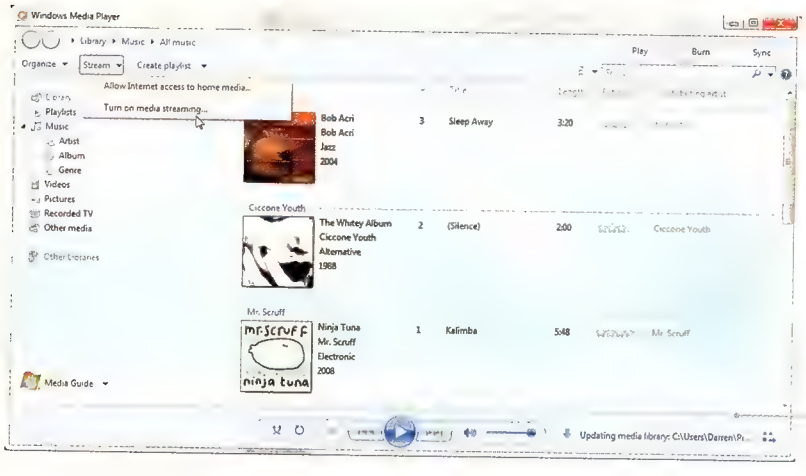
One of the most important uses of a home server is to hold backups of important files from one or more client PCs. There are a number of good client-side apps, such as EaseUS Todo Backup Free 5.0 and Cobian Backup 11, which will back up files from a client to a network drive (Cobian Backup can run as a background service). They can even be scheduled to perform the backups (full or incremental) automatically.

However, all of the free versions of these apps require installing on every client, so while you can perform an automated backup of a client, it has to be done at the client. A better option is a server-side remote client backup and that's what UrBackup (**urbackup.sourceforge.net**) does. It comes as two halves: a server-side app and a client app, both designed for Windows (you need both installed for the server to recognise the client). You can schedule the server to begin specific folder backups on multiple clients.

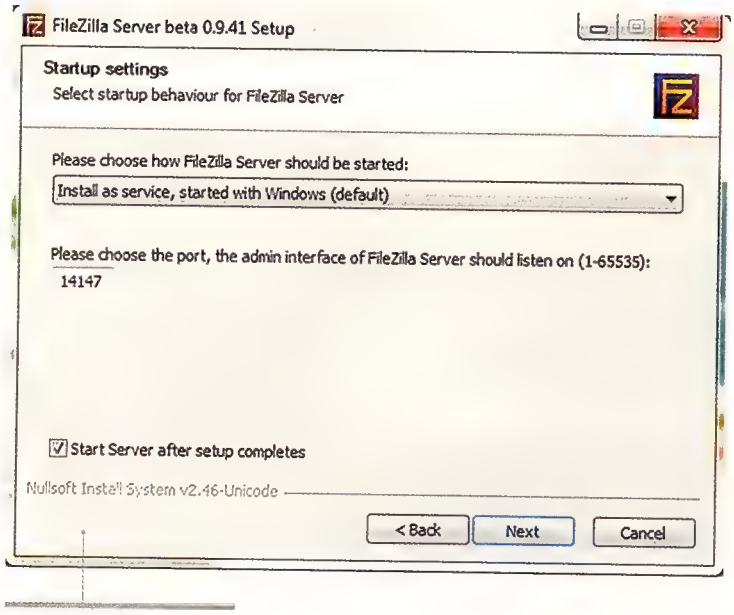
Another remote client backup tool to look at is Amanda (**amanda.zmanda.com**). Although there's a payware enterprise version, there's an open-source community edition, which will also do the job. You can grab the server-side app from **tinyurl.com/29gcsu** – select the latest version (3.3.2 at the time of writing) and scroll right to the bottom for Windows 32-bit and 64-bit releases.

07 MEDIA STREAMING

I've talked about media streaming before and how I reckon we should divide it into two types: passive (file serving) and active (file transcoding)



Windows Media Player 11 and 12 have a built-in UPnP server.



FileZilla FTP server works neatly with its FTP client.

streaming. A genuine media streamer takes media files in any format and feeds them to a client in a specific format required by that client. In a PC environment, media streaming just isn't necessary since every (Windows) PC has access to every audio and video codec imaginable anyway. However, for dedicated and mobile devices such as TVs and tablets where codec support is more limited, a live on-the-fly media streamer can be very useful.

Plex Media Server (**plexapp.com**) is one of the better solutions available. It's a commercialised fork of XMBC and while you have to pay for the mobile clients (Android, iOS and Windows Phone 7 are supported and are around $5 each), the server app and client-side Plex Media Center apps for Windows and Mac OS X are free.

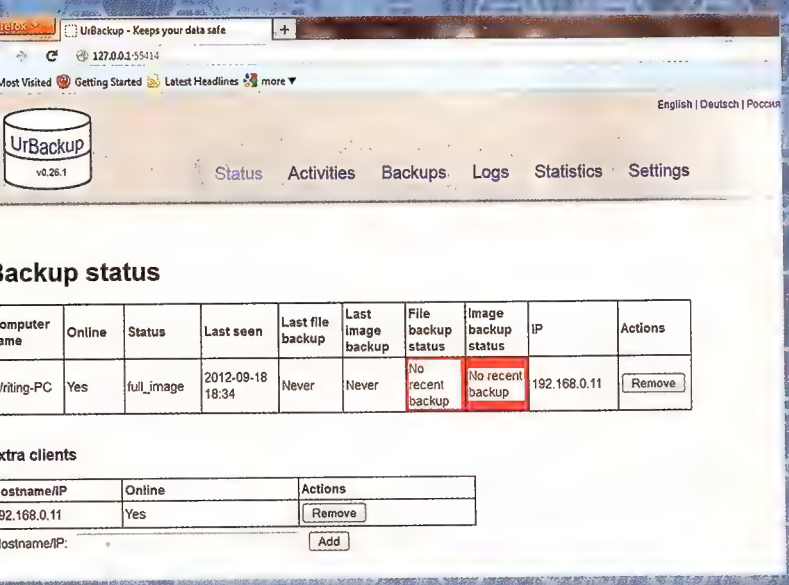
One of the most popular options for iOS devices is Air Video (**www.inmethod.com**) and again, the server app is free, while the client will cost you a princely $2.99. It'll transcode videos to iOS's standard H.264 format. There's a limited-function free iOS version called Air Video Free, which'll give you a taste of how it works. You'll need Apple's Bonjour Print Services app installed on the server, but iTunes will give you that anyway. If you don't want iTunes, grab Bonjour as a standalone installer from **support.apple.com/kb/DL999**.

Don't want to run iTunes? I don't blame you. Air Playit (**www.airplayit.com**) is a good first-stop alternative. It has client apps for iOS and Android (both free) and you can download the server for free, too. It's not quite as slick as Plex, but it's on a par with Air Video in terms of the user interface. If you can plug your tablet or smartphone into your TV via HDMI, you've got a neat network media player solution right there.

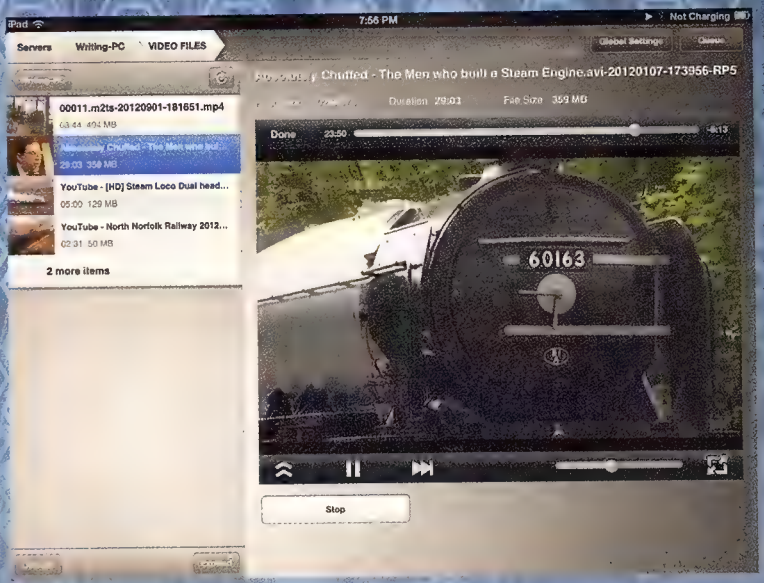
Got a Sony PS3 console you want to stream your media to? Grab PS3 Media Server (**www.ps3mediaserver.org**). On its own, it's a DLNA-compliant UPnP server and it's also loaded up with MEncoder and FFmpeg, so it'll transcode your files to other formats on the fly. It's written in Java, but there's a Windows installer available from the web site that you can download and install.

08 MUSIC SERVER

Another common feature that you'll find in most NAS boxes, an iTunes server, has actually been hard to replicate, even for NAS box makers, as Apple continually tweaks its iTunes software. Most iTunes server apps rely on some form of Apple's DAAP (digital audio access protocol)

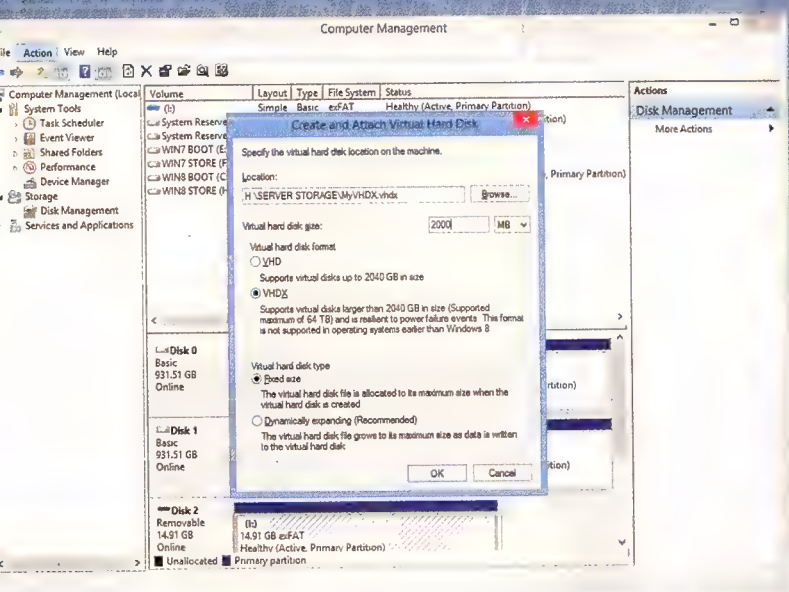


UrBackup, an open-source client/server backup for Windows

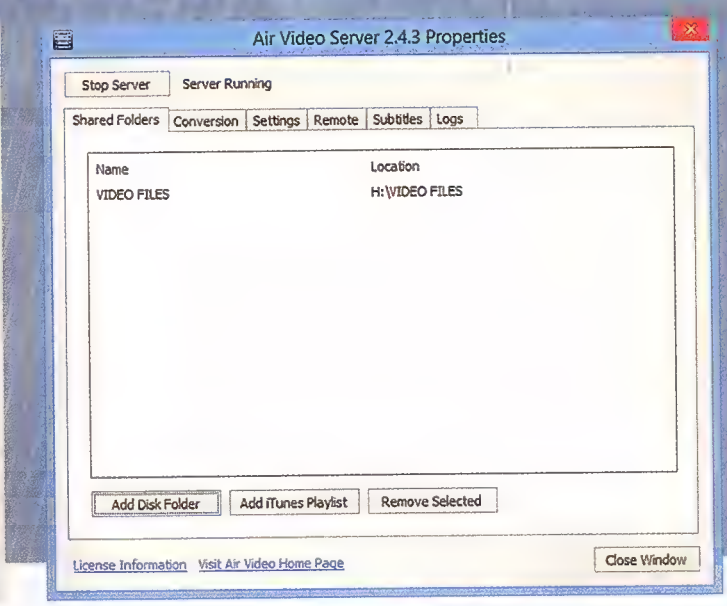


Air Video is the most popular media streaming app on iOS

The Air Video server app is free (Air Video for iOS costs $2.99)



Use Windows to create virtual hard disk drives to simplify storage allocation



The Air Video server app is free (Air Video for iOS costs $2.99)

and recent changes have seen many of them break in recent times. However, if you're running a standard desktop version of Windows as your server, you just need the iTunes client.

You can share your music folders by selecting 'Edit > Preferences', clicking on the 'Sharing' icon and selecting 'Share my entire library'. The only issue is that you need iTunes running on the server the whole time, otherwise other iTunes clients on the network won't see your shared music (read more at **support.apple.com/kb/HT2688**).

Similarly, WMP 11 and 12 can also share your music over the network. Just launch WMP and select the 'Stream' option – you can choose to access your music over the internet or just within your homegroup on your local network.

If neither of those options grab you, you can try Icecast (**www.icecast.org**), which is supported by a range of media players including VLC, Winamp and foobar2000.

09 VIRTUAL HARD DRIVES

If your home server is going to be shared between users, the problem with having an all-in-one storage setup is that anyone could grab more than their fair share. That's where the idea of virtual drives comes in. To those outside the server, the drive will look like a standard network-accessible drive once you share it, but it's actually just a file that resides on the server. The standard Windows 7 Home Premium release allows you to create virtual drives quite easily. It's a perfect way to allocate storage on a per-user basis without having to bother with separate partitions.

We don't have the space to cover it here, although you create them using Windows Disk Management. Go to 'Action > Create VHD' and then choose the type, size and location of the virtual drive. It'll appear in the 'Disk Management' window, where you can initialise and format it as a (seemingly) normal Windows drive, as well as share it across the network. You can create VHDs up to 2TB in size in Windows 7.

DO IT YOURSELF

Ideally, it'd be great if Microsoft kept WHS ticking over for longer than the end of next year. At least rolling your own is Microsoft independent and works on any version of Windows from XP Home Edition up. So if you're thinking about building a home server, don't let the demise of WHS stop you. Use the Windows you've already got.

Overseas calls & messages on the cheap

Use special apps and services on your iPhone to bypass your carrier's expensive rates.

APC EXPERT

JENNETH ORANTIA

Jenneth has been writing and obsessing about mobile technology for nearly a decade. Her first i-device was a Compaq iPAQ, and she counts jailbreaking and installing custom ROMs as two of her favourite hobbies.

Thanks to the prepaid price wars, it's now cheaper than ever to fire off bucketloads of calls and texts to people in Australia. Unlimited plans can be had for just under $40 per recharge and if you're happy to pay for an entire year's worth of access up front, plans like Red Bull's Access 365 give you unlimited calls and texts for the entire year – plus 5GB of data per month – for only a dollar a day. But what if you want to call and text friends overseas? Unfortunately, none of the prepaid unlimited plans cover international calls and texts, although some carriers, like Amaysim, let you add extra credit to your account to cover these services.

Many of the regular capped prepaid plans let you put your monthly credit toward international calls and texts, and a few of the postpaid plans (such as Vodafone's $59 and higher plans) include unlimited international text messages. For the Vodafone plans, however, it's worth pointing out that the unlimited offer covers text messages only – picture messaging is still charged at 55c a pop for both Australian and international numbers.

FREE MESSAGING

If you don't have the luxury of unlimited international text messages on your mobile plan, there are lots of other options that let you bypass your carrier and send the messages through a third-party service over the internet. For text-only messages, these translate to only a couple of kilobytes out of your data allowance each; if you're sending pictures, videos and other files, your data consumption will be bigger, but this is only an issue if you're using mobile data rather than Wi-Fi.

If the person you want to send a message to has an iPhone as well, your best option is sending it through the stock Messages app. The beauty of this approach is that the recipient doesn't need to have any special software installed on their iPhone – the message will appear in the stock Messages app like a regular SMS (even though you've sent it over the internet, rather than through your carrier), but with extra functionality like time stamps for when the message was delivered and read.

The easiest way to tell whether the person you're sending a message to has an iPhone is by composing a new message, putting their name in the 'To' field and then tapping on the text entry field. If it says 'New iMessage' on the top of the screen and the 'Send' icon is blue, that means they have an iPhone, and any messages you sent to them will be free.

If your intended recipient doesn't have an iPhone, another

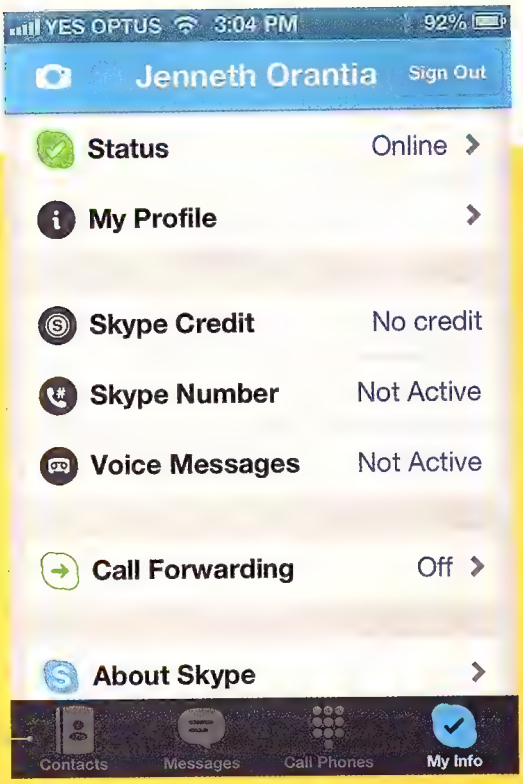
CALLS ON THE CHEAP

If you need to call someone directly on their landline or mobile phone, you can still get cheaper rates than what your carrier charges by adding some Skype credit to your account and/or opting for a Skype subscription.

Buying credit is the best way to go if you'll only be making Skype calls occasionally. You can buy Skype credit in packages of $16 and $40, and you can set it up so that it automatically recharges every time the balance falls below $4. Rates to call landlines and mobiles worldwide start from 3c per minute, with connection fees that vary between countries (landlines for Australia cost 6.9c and mobiles cost 12.9c).

Skype subscriptions offer great value: for $12.99 a month, you get 60 minutes worth of calls to landlines and mobiles in Australia, which works out to be around 21.7c a minute with no connection fee. To put that into perspective, Optus's prepaid rates charge calls at 89c per minute with a 39c connection fee. If you only need to call landlines, you can go for a cheaper Unlimited Australia package that costs $7.99 a month.

Skype also offers subscription packages that include international calls, which is ideal if you have friends and family overseas. The Unlimited World subscription costs $13.49 a month and gives you unlimited calls to landlines in 41 countries, plus unlimited calls to mobiles in Canada, Guam, Hong Kong, Puerto Rico, Singapore, Thailand and the United States.



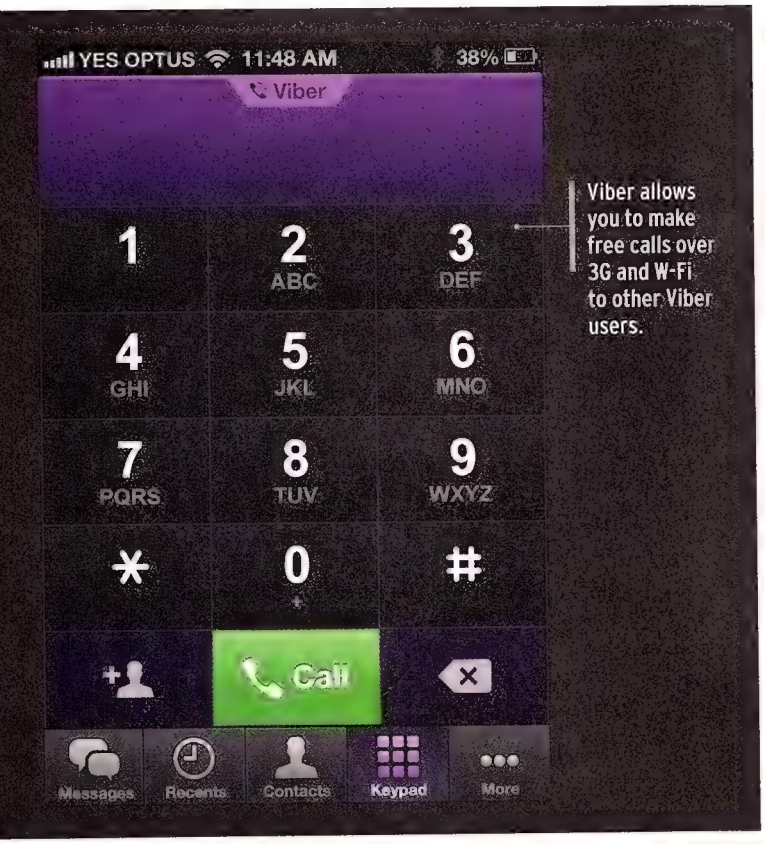
Skype offers great rates for overseas landlines and mobile calls.

good option is Facebook Messenger. The advantage of this system is that almost everybody has Facebook installed on their phones, so they won't need to install any new software to receive messages. If the person is logged into Facebook on a computer, the same message will also appear there.

Downloading the separate Facebook Messenger app is a good idea if you intend to use this on a regular basis, as it makes it easier to jump directly to the messaging function. Facebook Messenger supports group conversations and attaching photos, but it doesn't show read receipts (handy for knowing whether someone is ignoring you or just hasn't read your message yet) or let you attach other file types like videos and audio. For those features, you'll need a more robust instant messaging client like WhatsApp Messenger.

WhatsApp Messenger offers several perks over other messaging services. For a start, it's truly cross-platform, with clients available for iPhone, Android, Windows Phone, Symbian, Nokia Series 40 and BlackBerry. When you install the app for the first time, it combs through your address book to find other people who are using WhatsApp and automatically adds them to your WhatsApp favourites. This means you don't need to know any special usernames to message people, as it bases everyone's ID off their mobile phone number.

As with Facebook Messenger, WhatsApp uses push notifications for new messages, so they appear instantly on your phone and any phone you're sending messages to, not unlike a traditional SMS.



CHEAP CALLS

When it comes to making free/cheap international calls from your iPhone, there are two main options: Skype and Viber. Both let you make free calls over 3G and Wi-Fi to other users of the service, letting you bypass expensive international call charges through your carrier.

There isn't really a clear-cut answer as to which service is better, as there are pros and cons for each. Skype has the advantage of being available on more platforms: there are Skype clients available for iPhone, iPad, Android, Windows Phone and Symbian, whereas Viber is only available for iOS and Android – there are Windows Phone and BlackBerry clients available, too, but these don't support voice calling yet.

Skype is also available as a desktop app, which means you can call people directly on their PCs or Macs. Skype also supports video conferencing, as well as calling mobiles and landlines if you add credit to your Skype account.

However, there are two big disadvantages to Skype. The first is that you need to know a person's Skype username before you can add them to your contacts. The other is that you need to be signed into Skype to receive calls, which means the app needs to be running on your iPhone in the background.

Viber doesn't have these shortcomings; like WhatsApp Messenger, it goes through your phone book when you first install it to find any other Viber users and automatically adds them to your contacts list. Viber also uses push notifications for incoming calls, so even if you don't have the app running in the background, you'll get a banner alert on your iPhone when someone is trying to call you.

That said, Viber isn't as full-featured as Skype – it doesn't support video conferencing, doesn't support calling external landlines and mobiles, and phone calls are limited to iPhones and Android phones only. Our advice is to have both of them installed on your iPhone.

Using an iPad for higher learning

The hundreds of free courses available in iTunes U can save you thousands of dollars on higher learning! Here's how...

APC EXPERT

JENNETH ORANTIA

Jenneth has been writing and obsessing about mobile technology for nearly a decade. Her first i-device was a Compaq iPAQ, and she counts jailbreaking and installing custom ROMs as two of her favourite hobbies.

Digital textbooks may not have really taken off in Australia, but there are still a wide variety of high-quality educational resources and apps that you can take advantage of on an iPad – many of which are completely free of charge.

Apple's iTunes U is an amazing source of free courses from respected universities around the world, including Stanford, Harvard, Oxford, Berkeley and UNSW. There are hundreds of courses available across a dizzying range of subjects, from beginner's philosophy and Australian Aboriginal history to C# programming and human resources management.

All of the iTunes U courses can be found either in the desktop version of iTunes or through the iTunes U app, which you can download from the App Store. In iTunes, click on the 'iTunes U' tab at the top of the program window. From there, you can navigate through the courses available by institution (the specific universities and colleges that are offering courses) and subject category using the quick links in the top right-hand corner.

When you find a course that you're interested in, click on the link to open it and select the 'Subscribe Free' button. By default, this will only download the latest lecture in the course, but you'll probably want to download all of them so you can have the complete course.

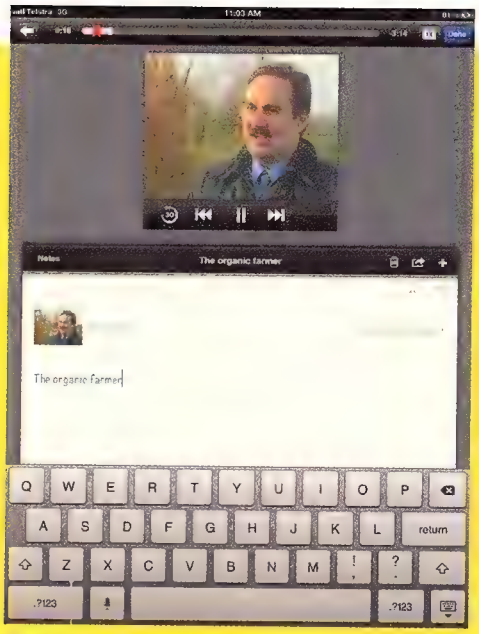
To do this, you'll need to click on the 'iTunes U' section in the left-hand pane of iTunes, double-click on the course name, then click the arrow button next to the name of the first lecture to expand the rest of the lectures. Click the 'Get All' button, and iTunes will proceed to download the rest of the lectures from your chosen course.

The structure of each course is varied. Some of the courses are simply a collection of video lectures on a particular subject, while others take the form of a course notes binder that incorporate learning outcomes, subject outlines, assignments and all of the course information, which can be made up of various file types – audio files, videos, presentations, PDFs and ebooks.

Once you have the iTunes U app installed on your iPad, iTunes will automatically download any new courses whenever you sync it with your computer.

All of the ebooks are opened within the iBooks app, so you can take advantage of features like highlights, dictionary, notes and search, and any annotations you make to the book can then be found in the 'Notes' section of that course in iTunes U. If you highlight something in one of the PDF books, for example, this will appear in the 'Notes' section of the course and you can write further notes on that annotation by tapping on the arrow icon next to it. You can also make your own notes independently by opening the 'Notes' section and tapping the '+' icon in the top-right corner.

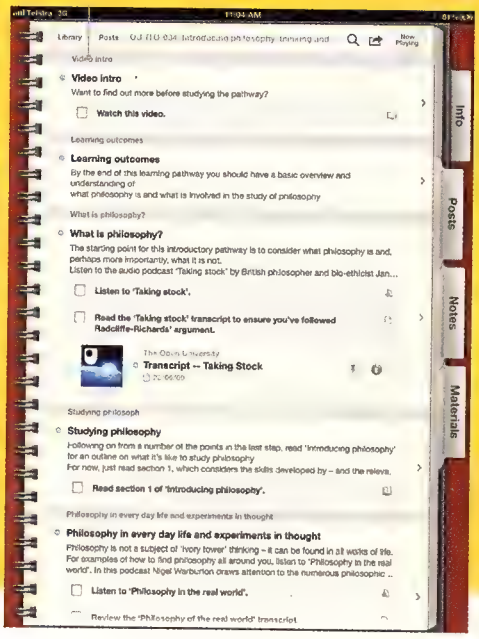
You can make notes while you're listening to an audio lecture or watching a video lecture as well, by tapping on the note icon in the top right-hand corner while it's playing.



You can annotate video lectures as you watch them.

The iTunes U app contains all the courses you can imagine, from a range of unis.

Each course is structured differently.



Dual-boot your Galaxy S II

Itching for a taste of Jelly Bean, but don't want beta quality? Dual-boot it.

PC EXPERT

SIMON CHESTER

An Android enthusiast since the days of the Dream, Simon has watched the fledgling OS grow from curio to juggernaut, and has rooted, ROMed and tweaked more devices than is polite to speak of. Join him as he shows you how to make the most of that Android powerhouse in your pocket.

Sometimes you want to have the option of trying out a new ROM for your phone, even though the ROM may not be stable enough for everyday use. This is especially true on new releases of Android – you may be running a fantastic Ice Cream Sandwich ROM day to day, but are just really keen to see what the latest alpha/beta Jelly Bean build offers.

Luckily for me, given the crazy popularity of the Samsung Galaxy S II, there are some diligent developers out there who have worked to make dual-booting (at this stage, it only works with ICS- or JB-based ROMs) versions of Android possible on the device. This is made technically possible by sharing a special kernel (known as the SiyahKernel) and using a hidden partition in dev/block to store a second ROM's /system directory, and the /sdcard (internal storage) to store /data and /cache inside a hidden folder (/sdcard/.secondrom). Genius.

As the time of writing, dual-booting for the Galaxy S III is still on Siyah's to-do list, but check his web site (**www.gokhanmoral.com**) for any future updates.

So, how do you achieve such unadulterated nerdery on your Galaxy S II? You'll need the latest version of the SiyahKernel from **www.gokhanmoral.com**. Go get it and put it on your phone's internal storage. While you're at it, also download the ROM you want to try (your secondary ROM) and place it on your internal storage, too.

Now, presuming that you're already running an ICS- or JB-based custom ROM (and most importantly, a recent version of the ClockworkMod bootloader) and that your battery is sitting above 90%, boot into ClockworkMod Recovery (either from your shut down menu or turning the phone on by holding volume up + home + power) and flash the new kernel. You then need to reboot and wait for Android to update itself. Ooh, look at the new kernel! Isn't it absolutely unnoticeable?

Next, boot back into Recovery and there should be a 'Dual Boot options' menu. Enter it and select 'Wipe 2nd ROM data/cache', which will prepare your phone for flashing a second ROM. This will probably take around 5 to 7 minutes, so go and make a cup of tea.

Once that's done, select 'Wipe 2nd ROM dalvik-cache' and then 'Install 2nd ROM from Internal SD card' (or the external card, if that's where you put it earlier). Enjoy your cup o' tea, as this will also take a few minutes.

Reboot and immediately after the boot logo, there'll be a three-second window where you can boot into the secondary ROM by pressing the home key or volume down key. To boot into your primary ROM, wait for the three seconds to complete, or either touch the screen, or press the power or volume up key.

The SiyahKernel also enables a host of tweaks – just install the free ExTweaks app from Google Play. It also enables BLN, which turns on your menu and back button lights when you receive a notification (just install the app from Google Play).

And there you go. If you were looking to make your current ROM your secondary ROM, or for a thorough selection of FAQ, visit **tinyurl.com/chz2t2a**.

*Many thanks to XDA Developers forum members **Phistachio** and **droidphile** for the information used in compiling this guide.*

Run multiple user profiles

Tablets are often a household item. Here's a great way to make your tablet support multiple users.

APC EXPERT

SIMON CHESTER

An Android enthusiast since the days of the Dream, Simon has watched the fledgling OS grow from curio to juggernaut, and has rooted, ROMed and tweaked more devices than is polite to speak of. Join him as he shows you how to make the most of that Android powerhouse in your pocket.

Computer manufacturers long ago recognised that more often than not, households would purchase a single device and share it among the various family members. Yet, despite the same thing happening with tablets, multiple users still aren't supported (yet – this will likely be coming up in the next version of Android).

There are ways to boot multiple ROMs (see the Android phone how-to on the opposite page, or the Boot Manager app), but this is cumbersome when you're really not interested in a whole new ROM, just saving yourself from having to continuously log into and out of Facebook. Thankfully, to steal a once oft-heard phrase, there's an app for that.

SwitchMe is a root-only app that allows you to create and switch between multiple profiles, each containing its own separate apps, data and system settings. Moving beyond the most obvious example of multiple users, this means you can also enter, say, an overclocked profile for when you're gaming, a battery-frugal profile (2G only, undervolt, bare minimum of apps installed, no syncing and so on) when you're trying to save juice, or even just a profile for when you're at work (meaning your work email only bothers you when you're actually clocked on... like the good, old days).

There's both a free and paid ($2.83) version, with the free one limiting you to only two profiles. The paid version also gives you security features, like password-protecting your profile. Chances are that you want both of these features.

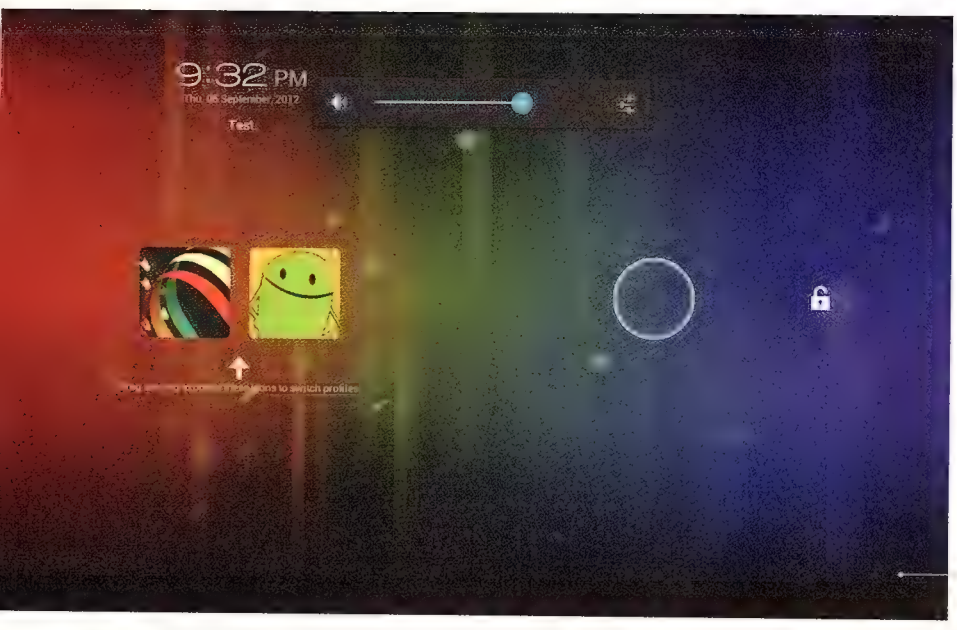
So, what's to know? First of all, running multiple copies of all of your apps will potentially take up a ton of space on your device, so make sure you have enough room (the app will warn you if you don't). Also, only the native Android Apps2SD implementation is supported and even it can still cause some problems, so it's best to keep your apps stored on your internal memory. Also, SwitchMe doesn't create a separate user data partition, so things like photos are still shared between profiles.

Prudence states that you should first create a nandroid backup of your device. Do so now. After you've installed SwitchMe from Google Play, the next thing you need to do is create your first profile. This will be your current setup and will be the 'admin' account, meaning it has the power to create and destroy profiles – just click that big 'Create Profile' button. The next profile you create can either be a clone of your current profile or a clean install of your current Android ROM (albeit with SwitchMe installed). If you wish, you can also grant it admin rights – your call.

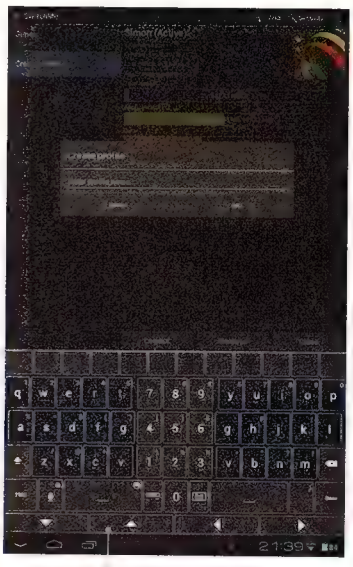
The interface to switch between profiles takes the form of a new lock screen for your device – simply move the lock slider over the icon of the profile that you wish to access. For security, it's recommended to keep the Android Keyguard enabled, especially as the profile screen won't appear at initial boot, meaning your admin account is open for use.

Unfortunately, at this stage switching profiles requires a reboot, although the developer hopes to eradicate this requirement in the future. Upgrading to Pro will probably inspire him *nudge*.

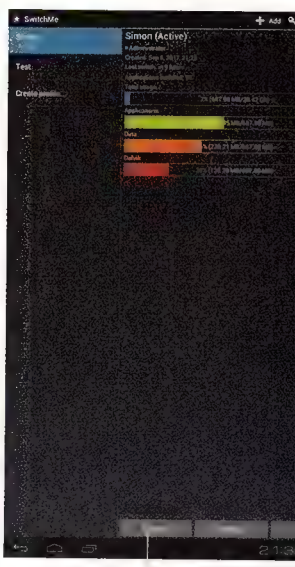
Problems? There's a thorough help guide provided, with some common issues covered. Enjoy! APC



The interface to switch between profiles is a new lock screen for your device.



The next profile can be a clone of your current profile or a clean install of your Android ROM.



SwitchMe allows you to create and switch between multiple profiles.

Build a smart TV network

Boost your TV's IQ with a tuned DLNA server — Neil Mohr shows you how.

PC EXPERT

NEIL MOHR

A highly experienced technology writer and editor, Neil contributes to a plethora of magazines and web sites. Special interests include reviewing new tech and the latest entertainment gadgets.

YOU'LL NEED THIS

HARDWARE

You'll need something to serve the files from. This can be a lowly NAS box, or a more substantial system if you want to make use of full transcoding, though many formats play directly.

SOFTWARE

A DLNA server of some description would be useful. We're going to use Serviio because it's one of the more reliable options, though Windows Media Player or Plex are both perfectly workable.

You might not want a smart TV in your home, but at some point you're probably going to own one, just like you're going to own a 3D TV. These sort of features are fast becoming standard. Take the Panasonic 2012 lineup of 22 models, for example. Of these models, only five lack any connected 'smart' features.

But what's so smart about these new televisions? It's happened very quickly, but TVs are now hooking into home networks. Using the DLNA standard, they're more than prepared to talk to anything else that's on the same network.

This has the potential for some interesting uses, such as wirelessly streaming a video you've taken on your mobile phone to your smart TV. Well, perhaps that's the most interesting one, but it also means you can easily share media stored on any PC with not just your TV, but any DLNA device. Your phone, tablet and other media streaming devices will all happily work together, as they're capturing DLNA-ready content and pushing it to other DLNA-ready devices.

It's when you throw our old friend the PC into the equation that it gets complicated. The PC's endless versatility and longevity mean you're likely to have videos and music lying around stored in codecs that haven't seen the light of day since last millennium.

What you need is an intermediary software service that turns your computer into an all-singing, all-video serving, DLNA-compliant device that your smart TV (and anything else for that matter) can see and play from over your network.

SERVING UP

For this project we're going to use the Serviio media server. It's more complex than other options, but as far as we're concerned, it's the most accomplished free DLNA server out there. It's certainly not the only option though. You can use the Windows Media Player-based UPnP/DLNA streaming, but it tends to be picky about what it wants to share and presents those files to connected devices as a huge, unsorted list. We've also recommended Plex in the past, but although it does a good job as a DLNA server, we've run into transcoding issues, and Serviio offers internet feeds that Plex doesn't.

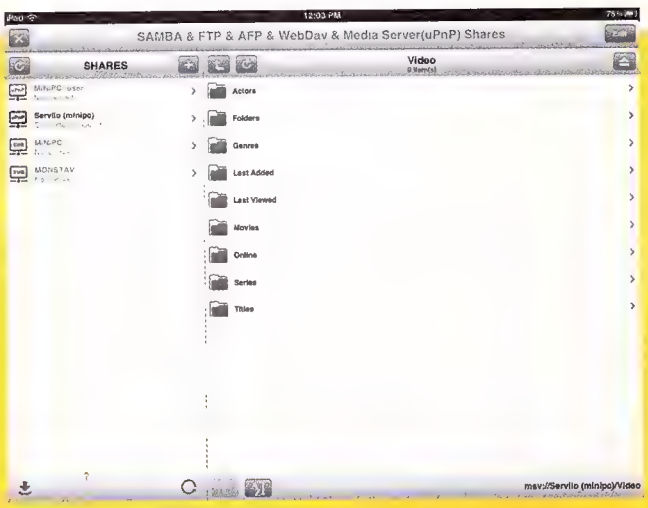
That last point is an interesting one, if not an entirely solid feature. Serviio has a flexible plug-in system that lets you add online streams, sources and other online on-demand video and audio services into the DLNA environment. It's a clever system because it means any DLNA device can now access the likes of ABC iview, PLUS7, YouTube and more, even if they can't access the web pages originally or lack a suitable app.

We say it's not entirely solid because it depends on there being a set 'feed' web page – either an RSS/Atom feed, or a web page that catalogues the feeds for a series or channel. Serviio then uses the plug-in to parse the feed or page and generate the standard DLNA-compatible list of media. The problem is, the system breaks if the original feed or web page changes, which happens more often than you'd think. For example, one issue we encountered recently was due to one of the TV sites switching to capitalised program names – a subtle change, but one that was big enough to break the plug-in completely. You have to remember that it's not entirely stable in that respect.

There may be an additional option available from your television manufacturer, which may provide DLNA server software. Not all do, but Samsung does with its AllShare system, while LG MediaLink ties into Plex. It also seems that Sony has recently launched a tool of its own called Homestream, though oddly enough, this is just Serviio with new icons.

ENCODE PROFILING

Nothing is ever easy and with DLNA especially so. Most PC-based DLNA servers provide a profile system. Why? It seems that despite the standard, every DLNA device has slightly different specifications for the type of video/audio they'll take, as well as being fussy about the resolution and/or the stream's bit rate. In the case of computer-based devices such as the Xbox 360, PS3, tablets and PCs, these profiles are more complex because some only take specific containers and formats. The Xbox is WMV, the iPad only likes MOV and the PS3 is after MP4. These most common devices will already have a profile in the 'Program Files > Serviio > Config > profiles.xml' file, which you can edit with a text editor to update for new devices or TVs. Some devices, such as the iPad, have specific issues because they only accept MOV or MPEG-TS files, which can't be re-encoded on the fly. You therefore need a custom app to support alternate DLNA-friendly files, which then have to use the CPU for decoding.



Remember, each device will be fussy about the formats it will accept.

CONNECTIONS

Smart TVs usually provide a wired Ethernet connection and expensive wireless dongles. Use a laptop in bridge mode as a simple alternative, or pick up a cheap bridging router.

TABLET TIME

Got a tablet? You can get DLNA, too. BubbleUPnP works well for Android, and is free. IOS has more issues due to its MOV reliance, but try the paid-for BUZZ Player or the free media:connect.

TARGET PROFILES

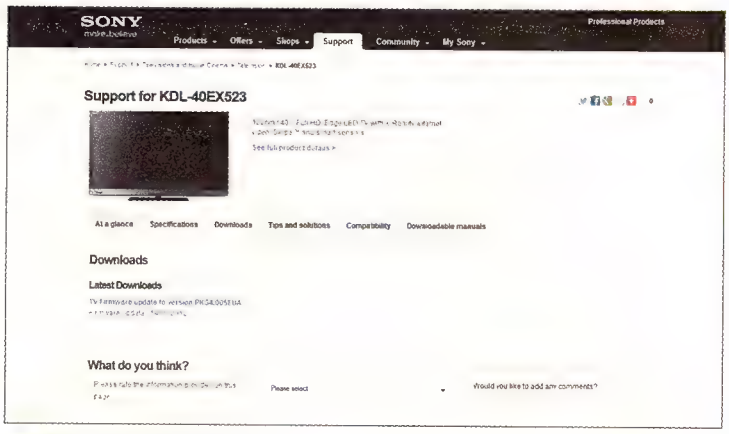
DLNA has gained traction over UPnP because it's a targeted subset of UPnP, specifying a small range of supported media formats, rather than the open-ended specification of UPnP. This leaves it as more of a transport and communication protocol for DLNA to ride on. The various formats it supports breaks down into the following categories:

- Image: JPEG, PNG
- Audio: AC-3, AMR, ATRAC3, LPCM, MP3, MPEG-4, WMA Video: MPEG 1, MPEG-2, MPEG-4 p2 (DivX), MPEG-4 p10 (H.264), WMV9.
- Containers: MPEG PS/TS, MP4, ASF (for video)

You'll notice there are no ancient formats in the list, such as AVI, MKV or even VC-1/WMV10 support. Any file not supported has to be remixed into a supported container in the best case, and in the worst case, re-encoded and remixed; in other words, transcoded to a supported format and container. So if you've tried UPnP servers in the past and failed to get them to play nicely with your smart TV, this is the likely reason. That's where Serviio or a similar service comes in to fill the gap and provide a beautiful media world to live in.

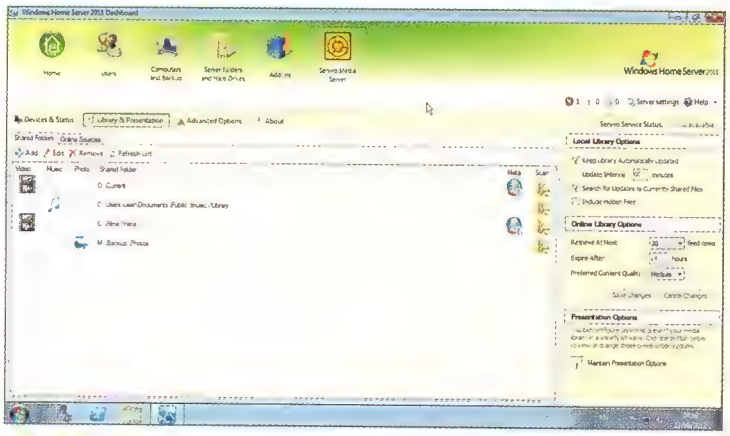
A SMART START

Getting your not-so-smart TV operational.



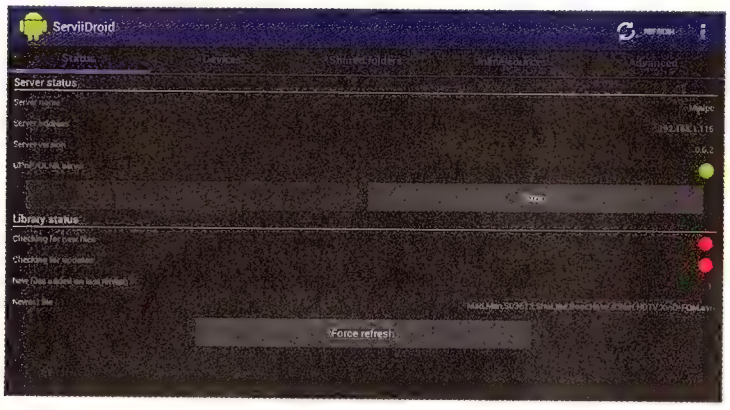
01 NOT ANOTHER FIRMWARE

Now that TVs are as smart as your PC, there's another device in the home with firmware for you to update, alongside its built-in software and upgradeable online content. It's well worth doing, though, because newer firmware can add up-to-date codec support. You'll need a USB stick for the download from the support site.



02 HOME SERVER OR NOT

We'll be looking at the standard Windows install of Serviio, but just so you know, those clever guys have produced a Windows Home Server add-in for all versions up to 2011. This provides a 'Serviio' tab as part of your main Windows Home Server dashboard. To grab this version, just browse to **serviiowhs.codeplex.com** and download it from there.

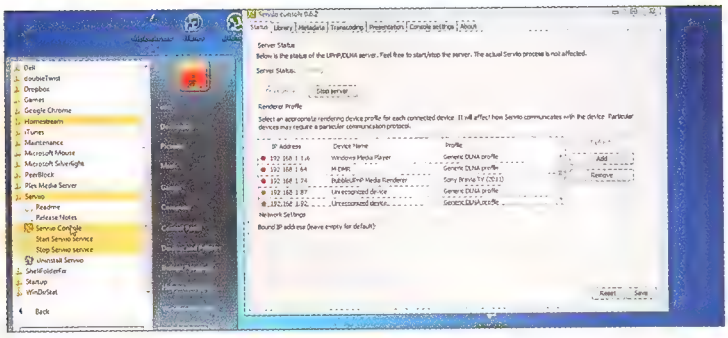


03 NAS & TABLETS

Serviio is very clever. Alongside Windows, Mac and Linux support, it can also be installed onto a number of NAS devices, such as the Western Digital My Book Live and D-Link DNS-320/5. To find out how, check the **wiki.serviio.org** web page. There's also a free Android app called ServiiDroid, which provides remote management of your local Serviio server.

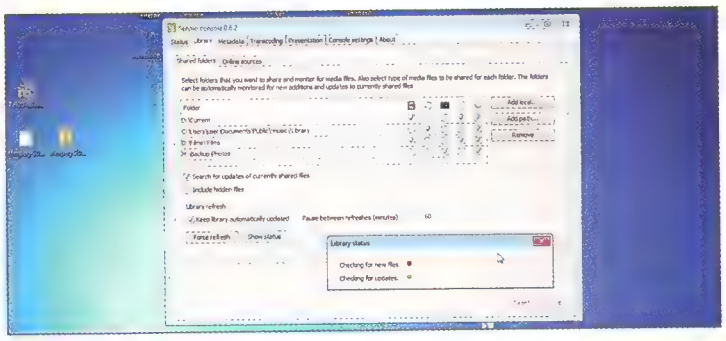
SERVING UP DLNA

Get media streaming up and running.



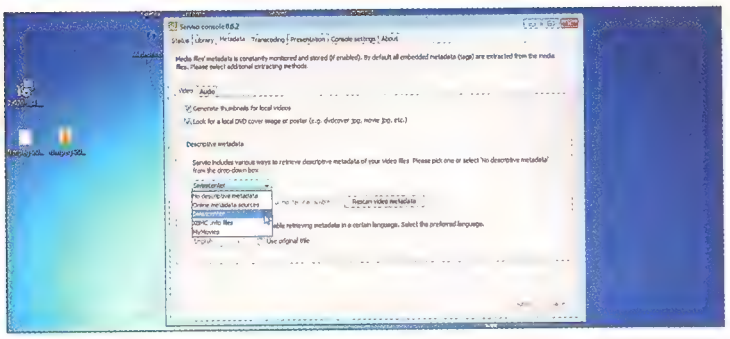
01 GET UP & RUNNING

Download and install the latest build from **www.serviio.org** via the 'Download' tab. Since Serviio is a Linux-based open-source development, it's a service foremost and an interface second. Thankfully, there's a GUI console available from the 'Start' menu and the notification area. This will provide all the main controls, along with feedback on connected clients.



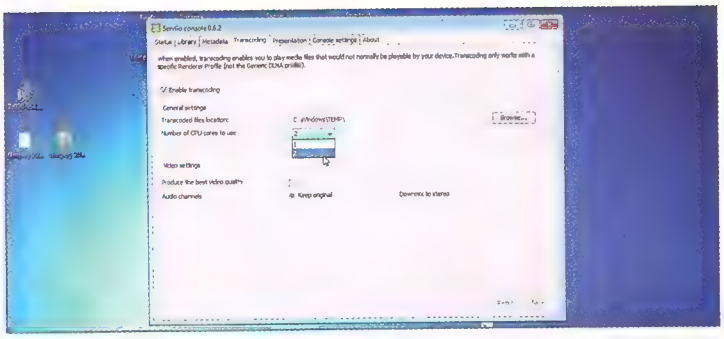
02 ADDING MEDIA

Click the 'Library' tab – this is the main area to add media you want to share. Two columns indicate whether Serviio should attempt to scrape metadata for videos, or if it should automatically update the library with newly detected files. Just click 'Add local' to add folders of your stored media and state if (and how often) it should re-scan these.



03 METADATA SCRAPINGS

Serviio will pass thumbnails to your DLNA devices to give you a prettier interface. It'll also use various online sources to try and scrape film and TV metadata, and serve this up as well. There's an option to use your own XBMC-formatted .NFO files from XBMC itself, or a standalone scraper like **www.mikinho.com/yammm** or **www.mediacentermaster.com**.

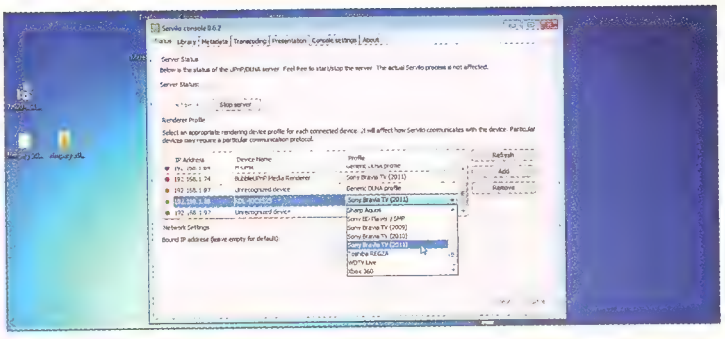


04 TRANSCODING

Take a look at the 'Transcoding' tab. You'll want to make sure the right number of cores are allocated to the job. On a quad-core CPU, for example, you may only want to allocate two. We suggest keeping the original audio because most devices can handle most default streams. We found that even a lowly 1.5GHz AMD Turion II could manage 720p HD media.

05 STREAM AWAY

At this point you can happily give your new DLNA server a spin. The majority of files should play just fine with transcoding, including MKV. Subtitles don't work unless they're embedded in the original file and are supported by the target device. Fast-forward and rewind should work, but transcoding can limit the range.

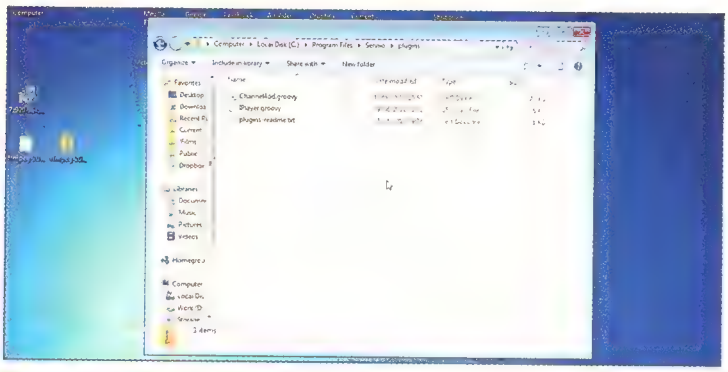


06 TROUBLESHOOTING

If you run into problems, make sure your device is marked green and is using the correct profile. If not, try a generic one. If this doesn't help, check the forum for user-created profiles. If some files play and you're trying an .AVI file, it's likely it's using variable bit rate audio – try using VirtualDub and re-save the file with Direct Stream for both streams to remove this.

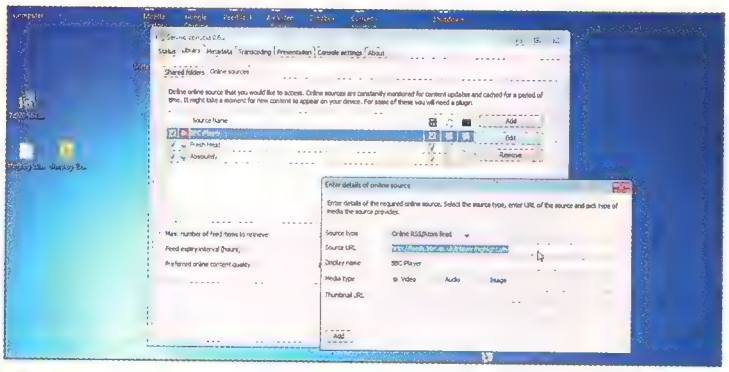
ADDING EXTRA SERVICES

Online streaming services are just a plug-in away.



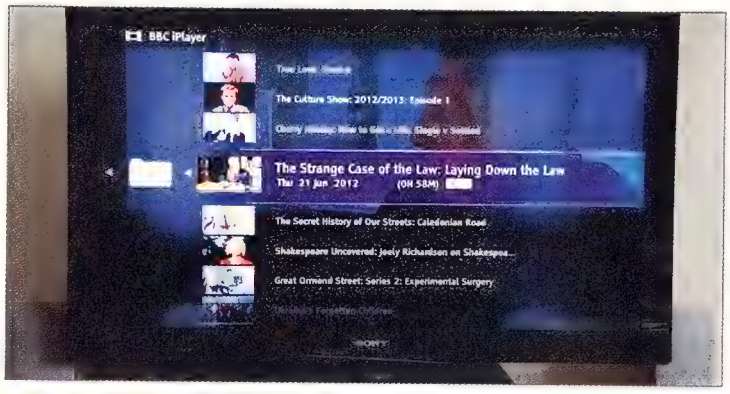
01 INSTALLING PLUG-INS

The online resource plug-ins are an ongoing development. If you head to **forum.serviio.org** and check out the 'Available Plugins' forum, you'll find links to the latest builds for the likes of the BBC iPlayer and YouTube. These are .GROOVY files and need to be copied into the 'Program files > Serviio > Plugins' folder.



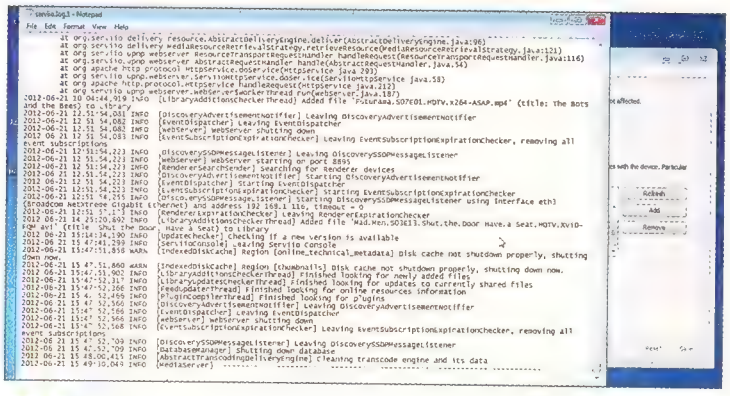
02 ADDING FEEDS

Those .GROOVY files tell Serviio how to decode the various web pages or RSS feeds to DLNA-friendly output. You'll find suggestions for feeds and pages in the same thread as the plug-in. To add one, select 'Library > Online sources', then click 'Add > RSS feed'. Enter **feeds.bbc.co.uk/iplayer/highlights/tv**, give it a display name and click 'Add'.



03 WEB RESOURCES

If someone is suggesting a web page that lists a series of episodes, then this is likely a 'Web Resource' option. If these work correctly on your smart TV, they'll be found under the 'Online' entry in the 'Serviio' menu. You should be able to pause and rewind.



04 ERROR CHECKING

The log file is hidden in the 'Program files > Serviio > Logs' folder. This provides detailed debug information, so if a file fails to play, this should be your first port of call. Check for 404 or 500 errors, as these will indicate an issue connecting to the web server. Try temporarily disabling any IP filters or firewalls and then check any URLs before retrying them on the TV.

SMART ENOUGH TV

The real issue with smart TVs is that they're not quite smart enough. Thankfully, a PC will unlock almost all of your home video, audio and picture content. We certainly didn't have issues with any of our modern 720p HD content playing from our low-power HP ProLiant server. Upping this to 1080p caused regular shudders as the CPU bobbed along above the 90% mark. We found that MKVs worked fine, but .AVI files tended to be hit and miss; the issue related to variable bit rate audio with no current built-in fix.

We had a much better time with streaming services. These take more work to implement – it requires integrating individual channels or series, but are useful if you know you're going to watch something regularly. These are fetched over the web, so keep in mind that any IP filters, firewalls or other blocks will still apply to these streams. If they don't work immediately, go through the error logs to see what's reported. A standard 404 or 500 error implies the site is being blocked somewhere along the way.

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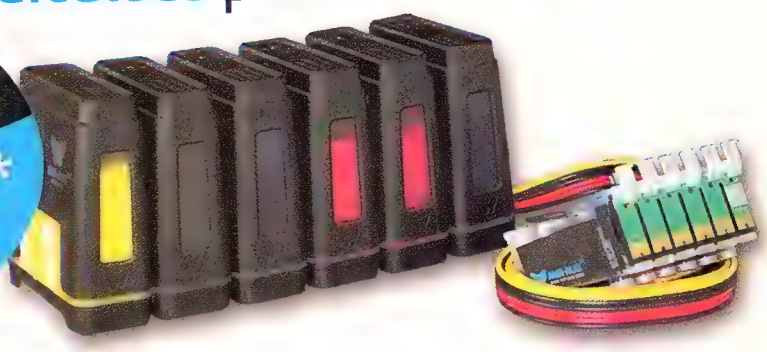

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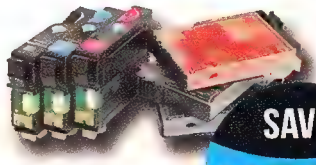

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Monitor your home

How to build a webcam security system with motion detection to protect your home.

APC EXPERT

NEIL MOHR

A highly experienced technology writer and editor, Neil contributes to a plethora of magazines and web sites. Special interests include reviewing new tech and the latest entertainment gadgets.

The price of computer hardware might be crashing through the floor, but that doesn't make it any less attractive to your neighbourhood criminal. No matter what the specs, a shiny-looking laptop sitting in the front room is still going to look attractive to a would-be thief peeking through the curtains when you're out.

CRIME ON THE RISE

None of this is helped by the fact that hard times breed an increase in criminality. Recessions fuel everything from pickpocketing on the street to home break-ins. But don't have nightmares – we're here to help protect your loved ones and loved things. It's not even going to cost much.

How does a personal, fully monitored, house-wide CCTV system sound to you? To give you even more peace of mind, we'll throw in remote internet monitoring and alerts, too. The finished security system can be triggered by motion, face 'detection', number plate recognition and even sound received via microphones.

Video streams can be recorded, multiple systems can be managed remotely and recordings can be triggered by motion or on a scheduled basis. We're not going to stop there, either – this project will tie into any home automation systems you may already use or want to add. Best of all, the essential software is free, though advanced features like text alerts, mobile access and internet control require a subscription. All you need to do is add a PC and webcams to create your own bespoke home security system.

The iSpy Connect open-source project (visit **www.ispyconnect.com**) has been running for many years and has evolved from a UFO-hunting tool into a mature package with a local client and streamlined server packages, and that's not to mention the long list of features it supports.

At first our motivation was to try to emulate a traditional home security system, with separate window, door and motion detectors. However, a webcam-based system can be designed to include all of these types of detection because it's simply checking for motion within set zones.

We also contemplated using an X10-based alarm system for this project, although doing so incurs the extra expense of a base PC X10 unit. While the cost of these units and the individual X10 devices has dropped a lot recently, it's still $140 for the base, plus extra for controllers and add-ons. Instead, we've decided to build our security system around the basic abilities of a webcam system, but it's still possible to extend the iSpy capabilities with X10 automation if you decide to do so later.

YOU'LL NEED THIS

ISPY CONNECT

Available for free from **www.ispyconnect.com**, this is an open-source project that was originally designed to capture images of ghosts and UFOs. Yes, really!

24/7 PC SYSTEM

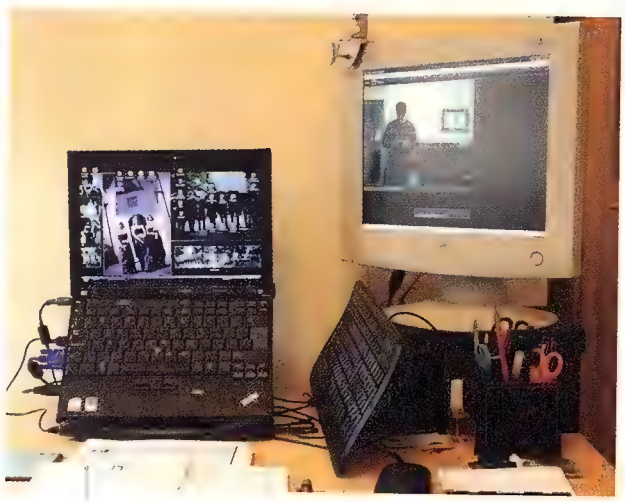
You'll need a low-end laptop or server running constantly to monitor the webcams, send alerts and run the recognition software.

WEBCAM & CABLES

The main use for iSpy Connect is as a security system that monitors security cameras, so you'll need at least one as well as suitable cables.

USB LEADS

There's no reason to spend your life savings on a wireless CCTV system. Active USB cables up to 10m in length cost $15 or so on eBay and are just as good as more expensive versions.



Use basic webcams to create a bespoke home security system.

WATCHMEN

You may be wondering why we're relying on cameras for our system. This is because a webcam that can detect motion can double as a door and window sensor, on top of general camera features like recording video and audio. Moving past these basic features, you can add the complex abilities like face and number plate recognition.

The downside of this is that motion detection is fallible. Pets, moving foliage and bright sun can all trigger false alerts; however, a little bit of careful placement should eliminate most of these issues.

SEEING IN THE DARK

Even the darkest night can't stop a basic webcam because the low-cost CMOS sensors inside are sensitive to infra-red (IR) light. Any dedicated 'security' camera will come with an IR

mode and IR illumination in the form of an array of IR LEDs.

To transform any cheap webcam into a night vision camera, it's simply a matter of removing the IR filter that usually eliminates this wavelength and replacing it with black negative film. It would be better to buy dedicated units and use any standard webcams for indoor or illuminated areas, though.

We're testing a system that uses a standard USB camera and an inexpensive IP-based Wi-Fi night vision camera with pan and tilt. The IP camera is useful because it tests all of iSpy Connect's camera abilities. It supports all web-based IP cameras, which are a necessity for larger installations that move beyond the practical 10m USB limit, or 5m with passive USB cables. There's also support for many pan and tilt cameras, although control implementation varies, so not every one of these devices can be supported.

PUTTING IT TOGETHER

Mounting a webcam can be a pain, as most just come with a clip for attaching them to a monitor's surround. A few models offer a standard tripod-compatible thread (the Microsoft LifeCam Studio is one such example) and some others have an M6-sized thread that can be attached via a standard adapter. If your webcam lacks either of these connections, try using epoxy resin to attach a bracket that can then be screwed directly to a wall or attached to a tripod.

We're building a modular system, so once you've added and configured one camera, it's easy enough to expand the network by doing the same again. We've covered adding a remote IP-based camera and microphone, and how to assign alerts with actions. The recordings can even be uploaded to YouTube for remote storage, in case the local server machine is stolen.

SERVER BUILD

We love servers here at *APC* – they make everything run smoothly in the background, letting us turn off our power-hungry desktop PCs and reduce our energy bills. The iSpy Connect system offers what it calls a server build, but it's not what you'd expect from the name. The idea is to enable you to link remote laptops and computers with cameras and mics installed to your main iSpy Connect system, but with a low-profile service.

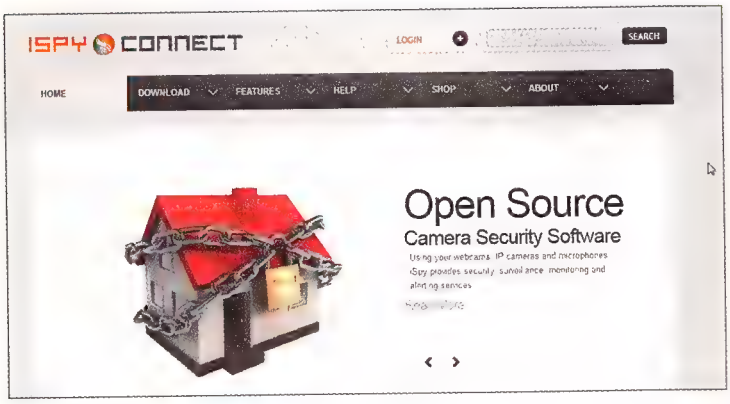
You'll still need the main iSpy Connect program to set up your security system and it's required to serve out data to the remote web server, while any recognition tasks you implement also have to be run on the main program.

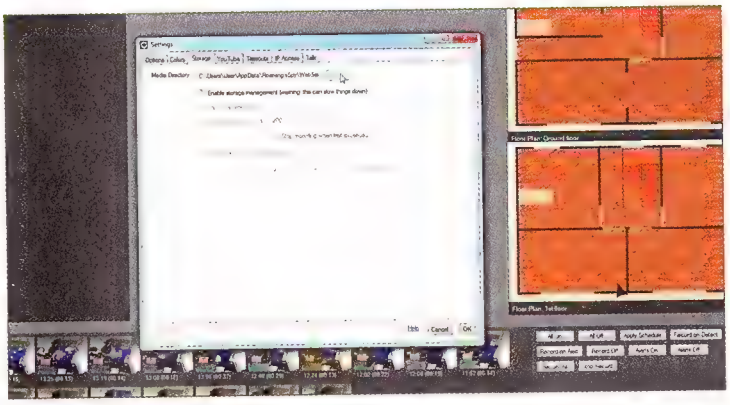
That last aspect can make the server program seem all but pointless, but it exists so you can access cameras on remote systems. We found we needed to create a Windows Firewall exception on a Windows Vista PC, so if you're having connection issues, check here first.

iSpy Connect lets you add a laptop's webcam to your system.

SETTING SECURITY

Storage, camera, action.



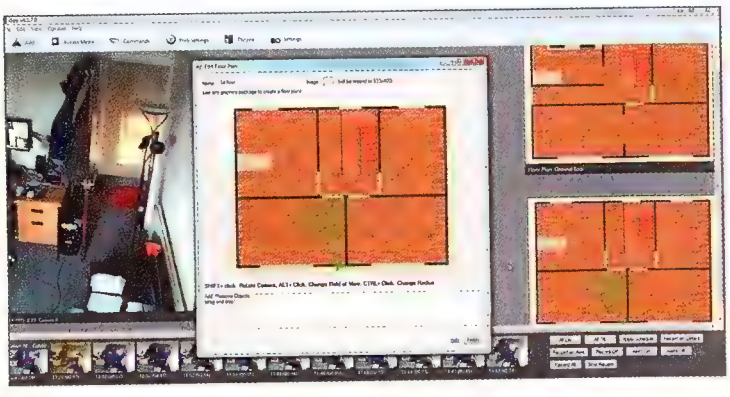


01 STORAGE HERE

Grab the iSpy Connect program from **www.ispyconnect.com** and install it. Download the face and plate recognition add-ons from the 'Plug-ins' section. Extract these files to C:\Program Files (x86)\iSpy\iSpy\Plugins. You'll also need VideoLAN for local playback of video files and we suggest creating an iSpy Connect account, as we'll use this later.

02 STORAGE THERE

Fire up iSpy and select 'Options > Settings > Storage'. If you're going to be saving a lot of recorded video on your system, think about the file sizes and make sure you alter the 'Media' directory to somewhere with plenty of space. It's also worth investigating the storage management option, as it can auto-delete files of a certain age to free up drive space for new footage.

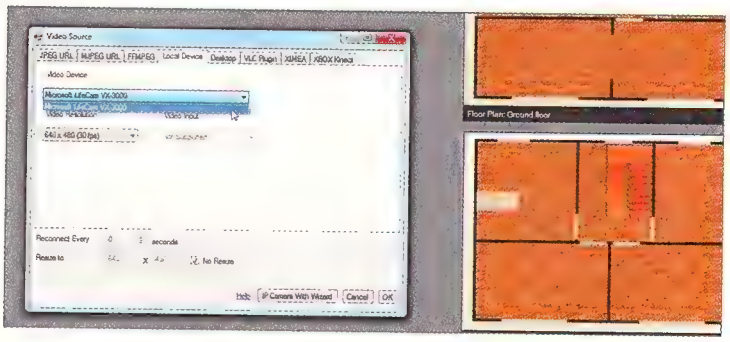


03 STORAGE EVERYWHERE

As an easy management option, iSpy can help you monitor your systems via a graphical floorplan. There are a number of web sites that can help you create these, like **www.homestyler.com/designer**. Once you've got everything planned, save it as an image file, right-click a blank area in iSpy and select 'Add floorplan'. When it's up and running, drag your cameras onto the plan.

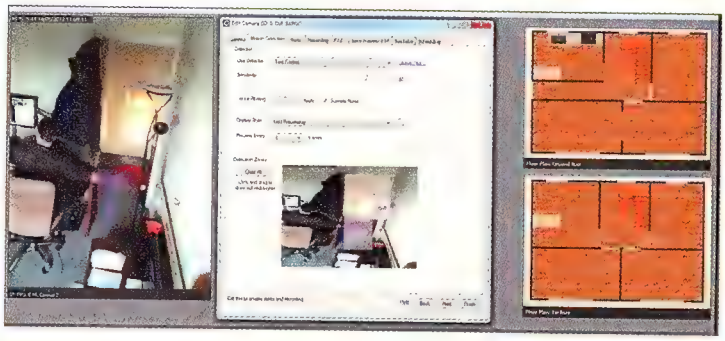
GETTING SECURE

Create a monitored fortress to protect property, possessions and people.



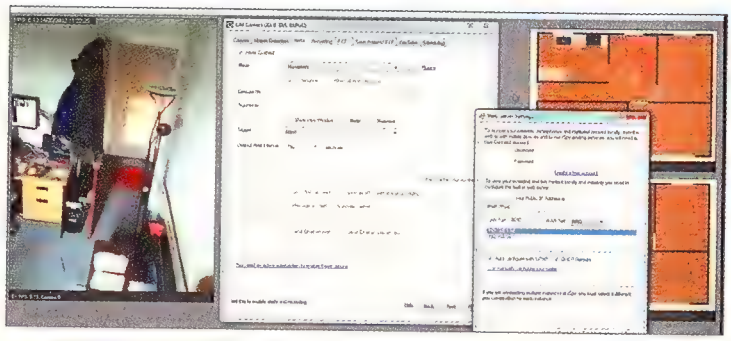
01 ADD LOCAL CAMERAS

To get started, right-click a blank area of iSpy and choose 'Add camera'. In the menu under 'Local Device', select a connected USB camera – we'll look at remote ones later on. Click on 'OK' and you'll see the main camera settings. From here you can customise detection zones, alert conditions, recording settings, YouTube uploading options and the details of scheduled recordings.



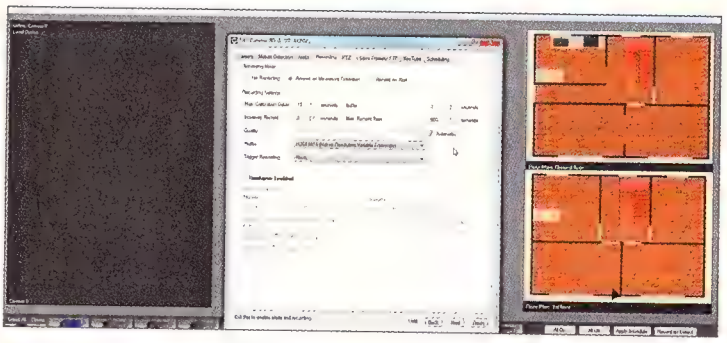
02 MOTION DETECTION

Click on the 'Motion Detection' tab. Here you can add and control monitored areas for movement. Draw rectangles on the preview area to add monitored sections. On the live preview you'll see a blue bar and a green line, which show the detection and trigger levels. Adjust the sensitivity to control how much movement is required, while 'Display Style' alters tracking modes.



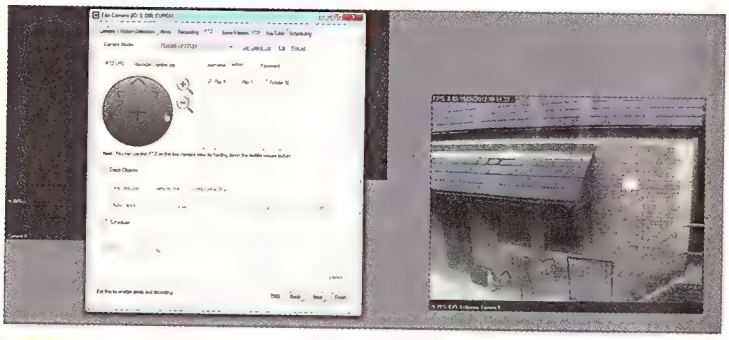
03 SET UP ALERTS

You can trigger an alert based on motion, face detection, the number of objects or lack of movement. This can run an .EXE file for X10 integration or send an SMS, email or tweet to you when it detects something. This last option is done via your iSpy Connect account, although the SMS part requires a paid account, which is understandable. See opposite for more on subscription services.



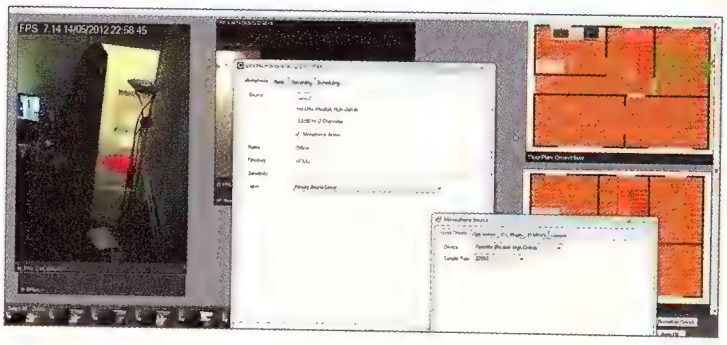
04 RECORD FOOTAGE

To record video, go to the 'Recording' tab and select either 'Record on Movement' or 'Record on Alert'. The default settings are ideal, and the software appends the three-second buffer to the start. The H.264 codec uses around 20MB per minute. You might want to consider the mobile MP4 settings, but we recommend you avoid the AVI ones like the plague, even for desktop-only use.



05 MOTION CONTROL

We added an IP camera using the 'IP Camera with Wizard' button within the 'Add Camera' dialogue. Just select the model from the drop-down list and enter the username and IP. The PTZ provides motion control if it's compatible with your camera. Our cheap Tenvis camera worked a treat, although the 'Track Objects' mode was pretty skittish.

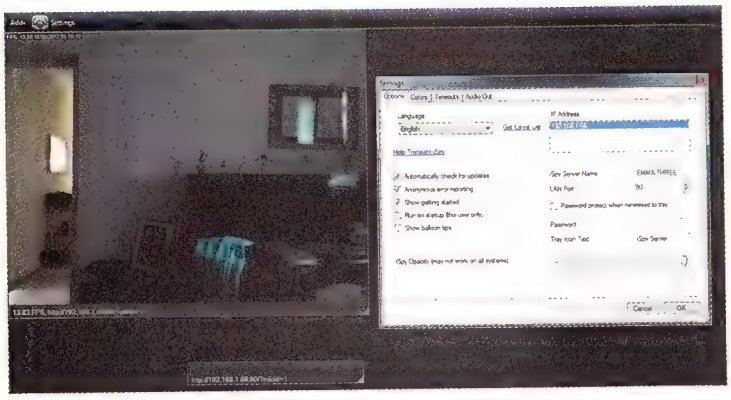


06 MICROPHONES

You add microphones to your system in the same way as cameras. Click 'Add microphone' and then select the option to add a local mic if your webcam has one built in. You can then set sensitivity, alerts (you could play a dog barking sound, for example) and also set recordings. Remote mics can be created by entering the IP of a remote iSpy server.

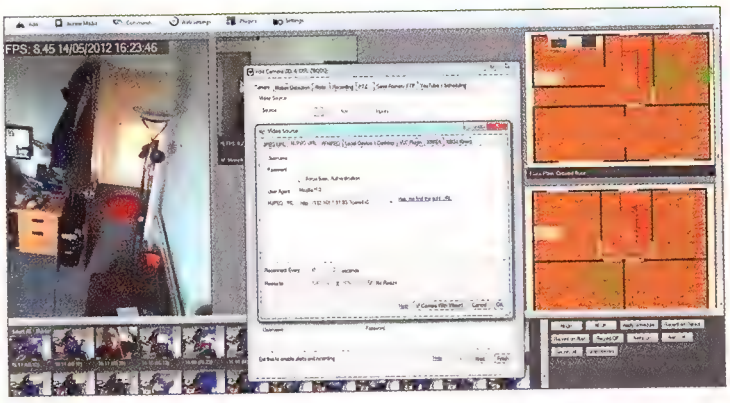
SERVING UP CAMERAS

Use iSpy Connect to link up remote cameras.



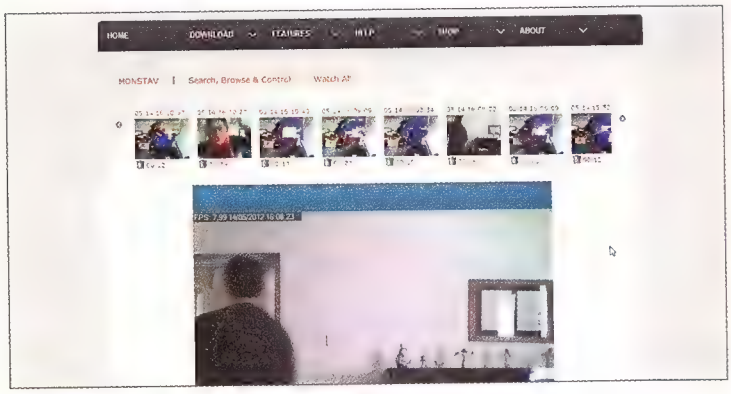
01 INSTALL THE SERVER

The server system is useful for installing on remote computers like laptops so you can access their built-in webcams or connected cameras. Install iSpy on the remote machine and once you're in its 'Start' menu, run the 'Server Installer'. If you're not prompted, make sure you manually set a Windows Firewall exception for iSpy Server. Now you can add the local camera as before.



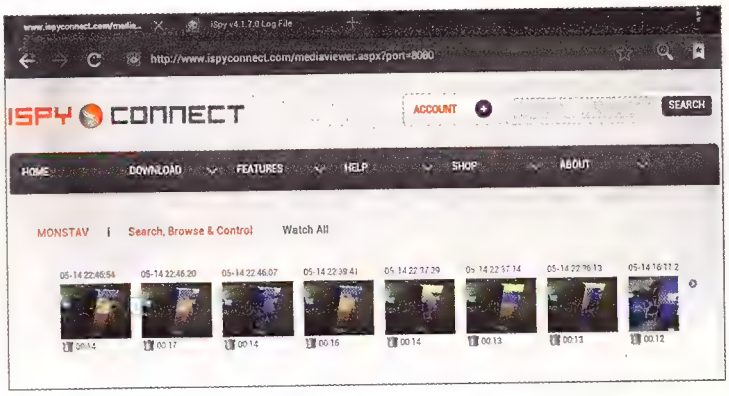
02 SHARE & SHARE

Once the preview of the local camera is running, take note of the 'IP', 'Port' and 'Cam Id' in the bottom-left of the display. Return to your main iSpy PC and add a camera. For the source, choose 'URL MJPEG' and enter the IP address you copied down. This should be **http://192.168.x.x:80/?camid=0**, or whatever your local network IP base is. You can also add a password for extra security.



03 WEB ACCOUNT

The free version of iSpy is limited, but you can still view recent recordings from your networked cameras, wherever you are. Logging into your iSpy Connect account from any desktop provides you with a basic control panel. This gives you recently recorded clips and you should be able to view playback direct from your monitoring computer for 10 seconds. If you can't, then it's been nicked!



04 MOBILE ACCESS

If you subscribe to the paid service, there's a dedicated HTML5-based mobile web site that even Apple devices will happily use, which can be used to control motorised cameras. The standard web site can still be accessed by mobile devices, although the video media player probably won't work. Some owners of Android devices may have more success, but we couldn't get it working.

SUBSCRIPTION SERVICES

While there's a lot to love about iSpy Connect, its more advanced features require a subscription. US$70 a year is substantial, but compared to paid security monitoring service, it's very reasonable. It's not the only option, though. If you want Twitter alerts, we found a simple workaround. Download a command line Twitter client and then install and authorise it with Twitter. Within iSpy Connect you can launch an executable for individual device alerts. Add the client executable with its path, then under 'Arguments' add the Twitter account, a suitable message and a timestamp, like `TWITTERNAME "Camera One Alert" timestamp`. We were also impressed by how cheap dedicated security cameras have become. These are the wireless IP-based dome devices you see in shops, which can now be picked up for around $70. At this stage you should only consider the US$70 annual subscription fee if you want full remote control. It's a bargain compared to full commercial packages, but making your own system is much more rewarding.

Watching you, watching them, watching TV.

Discover the magic of XPS files

Dan Grabham shows you how to store emails in XPS format.

YOU'LL NEED THIS

XPS ESSENTIALS PACK

If you're using Windows XP, you'll need to download this from **tinyurl.com/m667tk**. Its functions are built into Windows Vista and 7.

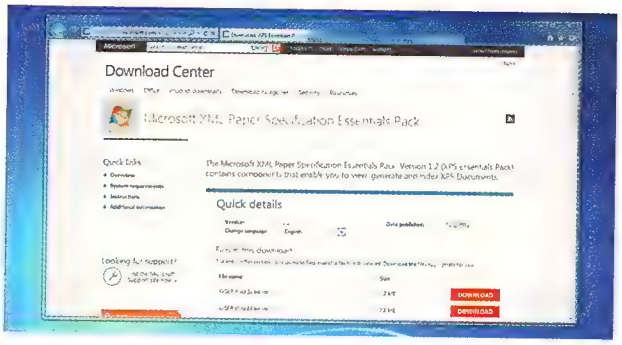
XPS, or the XML Paper Specification, is a very useful and relatively new file format. So what does it do? You've probably heard of PDF (Portable Document Format), which is the work of Adobe.

PDF is a format that anybody can read on virtually any device, regardless of whether they have all the necessary fonts or the correct program to open it on their PC. It's basically a universal currency, only in file terms.

XPS is another version of this type of format, developed by Microsoft, and it's now becoming part of many Windows systems. The software to create .XPS files comes standard as part of Windows Vista and 7, and is available as a small download for XP.

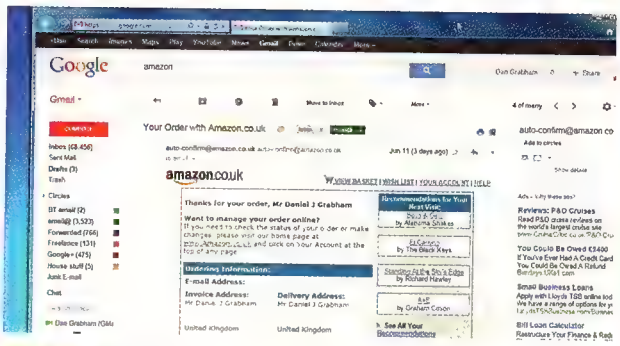
One of the best uses we've found for XPS is saving the receipts we're sent from online shops, so even if the original emails have long gone, we can still check back and find specific ones if necessary.

CREATE .XPS FILES FROM DOCUMENTS OR EMAILS



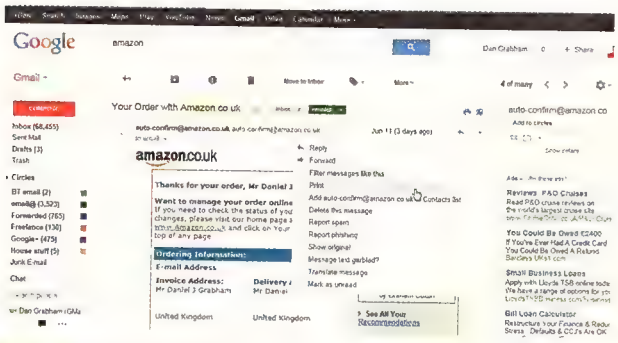
01 DOWNLOAD THE XPS ESSENTIALS PACK

If you have Windows Vista or 7, you'll already have the ability to create and read .XPS files. Click 'Start', type xps in the search box and the XPS Viewer will appear as the top result. If you're using XP, you'll need to install the pack from **tinyurl.com/cm667tk**.



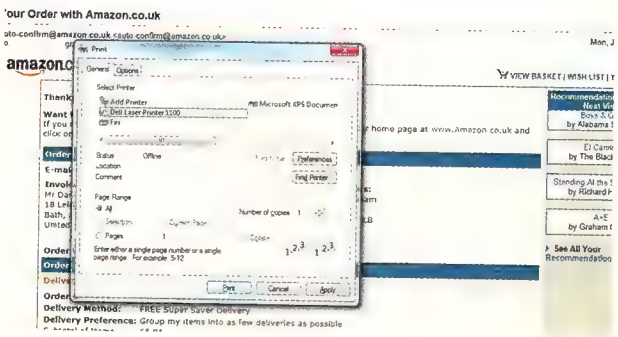
02 FIND YOUR RECEIPT

We're using Windows 7 and looking at an Amazon confirmation email in our Gmail inbox. We want to keep this receipt, so it's perfect for converting to XPS. You'll be able to convert any file or web page that you can print. That may seem strange, but all will become clear...



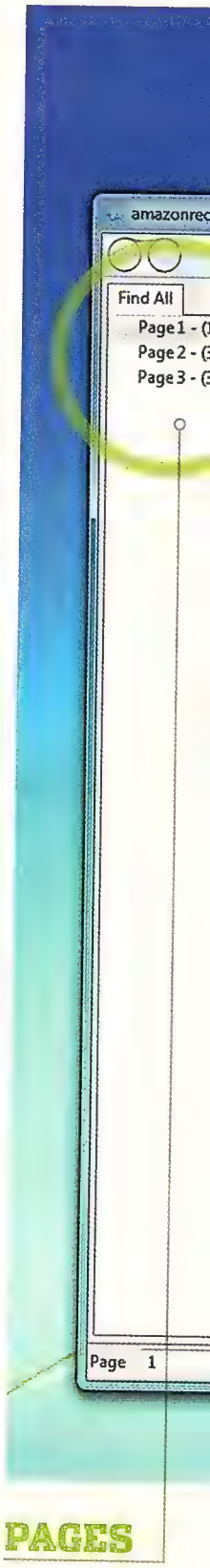
03 PRINT THE PAGE

Why must it be something you can print out? The procedure we're going to use to convert the file involves the 'Print' command within Windows. Making an XPS document means creating an image of the page or file, but saving instead of printing it. Select 'Print' as normal.



04 SELECT YOUR PRINTER

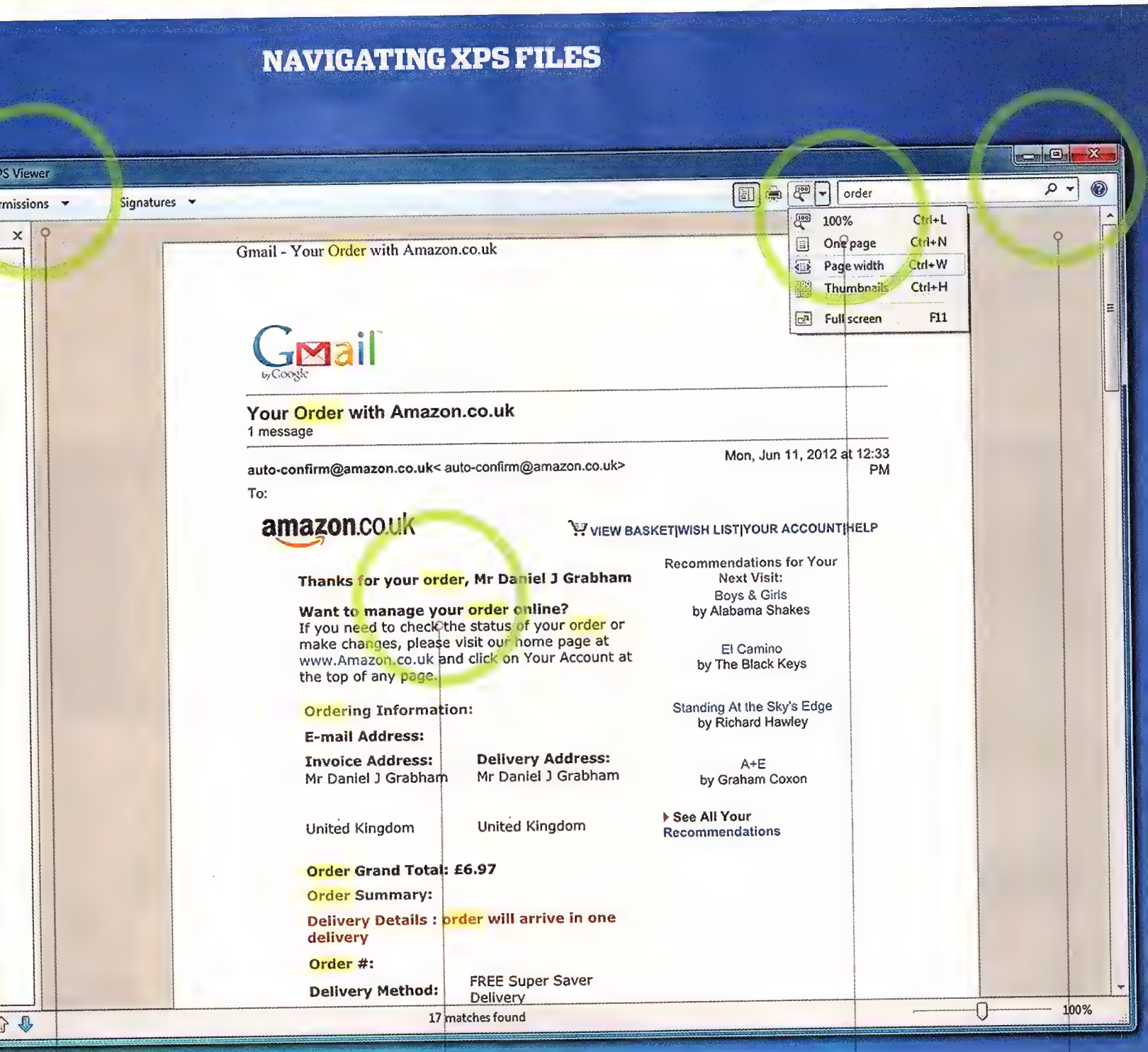
This is the standard 'Print' dialogue box. Choosing to print the message from Gmail has opened up a new tab and reformatted it as a printer-friendly page. We currently have a Dell printer as our default – it has a green tick next to it and a light blue highlight box surrounding it.



PAGES

You can see how many pages there are in the document as well as how many times your search term appears on each page.

NAVIGATING XPS FILES



SET PERMISSIONS

You're also able to perform other more complex tasks in XPS Viewer, such as controlling who can open the document.

HIGHLIGHTS

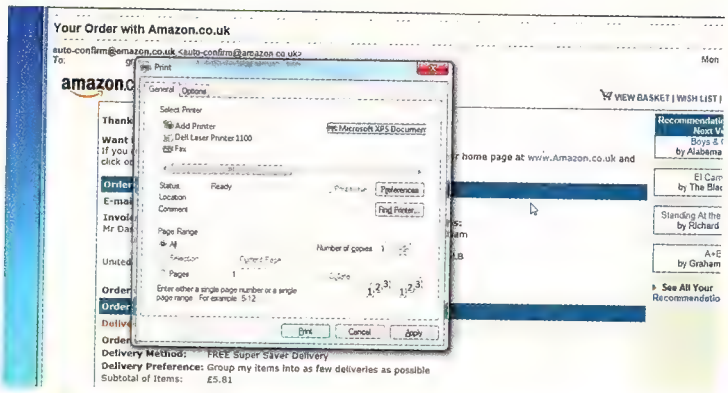
As you can see, the Viewer has highlighted the search term throughout the document.

'VIEW' MENU

Choose whether to view the document at full size or view it in a number of other ways.

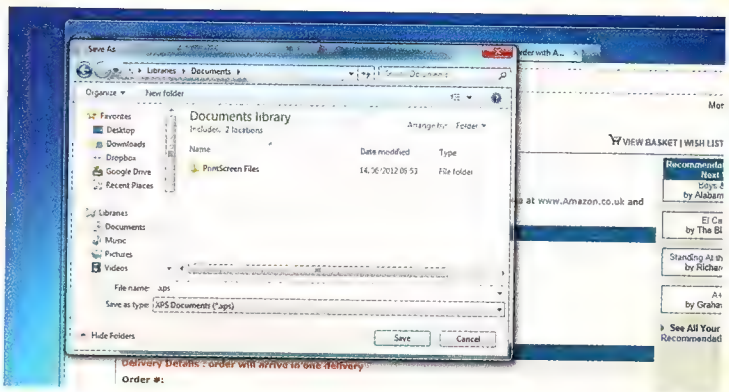
SEARCH BOX

Type anything in here, hit Enter and the XPS Viewer will try to find it in your document.



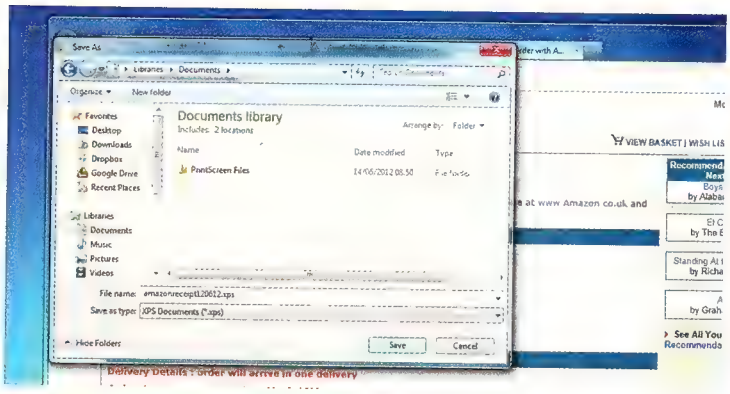
05 SELECT THE XPS WRITER

We don't actually want to print the receipt through the printer – after all, we want to store it on our PC rather than make a hard copy of it. Instead, we need to select the 'Microsoft XPS Document Writer', which you can see to the right of this dialogue box (it could be anywhere in the box). Once you've selected it, a blue highlight box will appear round it.



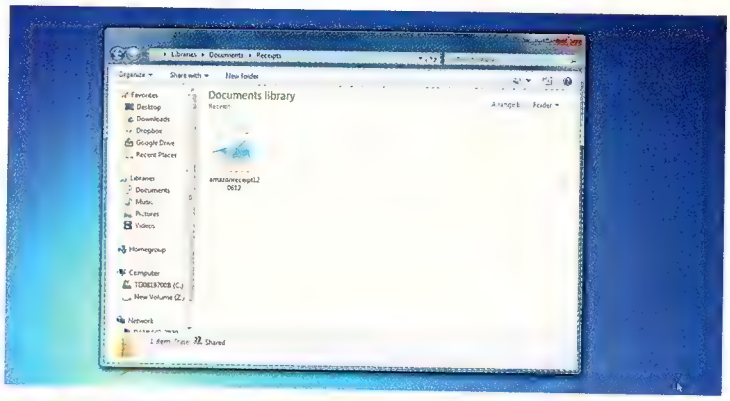
06 PRINT THE FILE

Note that in the previous step, the green tick stays where it is. We haven't changed the default printer – just what we want to use for this print job. Then, when you click 'Print', instead of a piece of paper you'll see a 'Save as' dialogue box. The software has prepared the .XPS file for you and is prompting you to tell your PC where to save it.



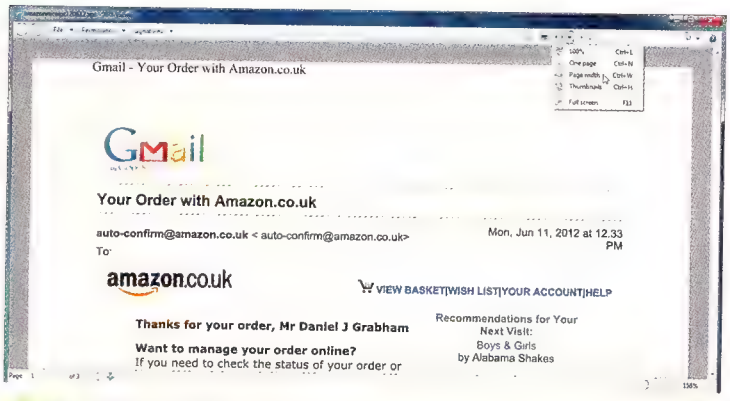
07 NAME YOUR FILE

Browse to where you want to save the file, just as you would for a Word or Excel document, and then choose a name for your file. We've called it 'amazonreceipt 120612.xps' and have appended the date so we'll be able to find it easily if we need to. Then click 'Save' and the file will be created in our chosen location.



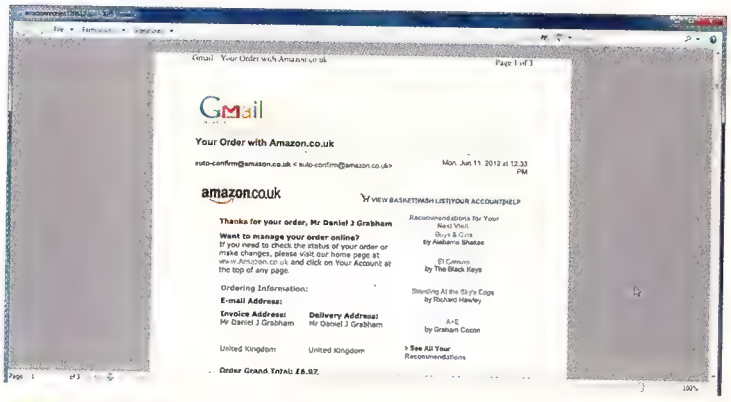
08 THE XPS VIEWER

Here's the .XPS file in our newly created 'Receipts' folder. Note that it has a shiny new XPS icon. You might be wondering how you can look at the file: which program will be used to open it? That's the job of the excellent XPS Viewer, which you can see in the next two steps. It enables you to open any .XPS file on your desktop.



09 OPENING THE FILE

Double-click the file and the XPS Viewer will open. You can use the menu next to the search bar at the top of the page to change the size at which you view the document – this works in a similar way to zooming into document pages in Microsoft Word or Excel. This can be handy for receipts with small print, but it isn't too much of a problem here.



10 THAT'S IT!

You can perform several tasks in the XPS Viewer, but it's primarily just a basic application that enables you to see an .XPS file somebody has sent you, or one you've downloaded from the internet. The idea is that XPS is a universal file format that can be used by everyone – we certainly find it great for keeping track of all of our shopping receipts.

Build a Linux router

Turn your trusty Linux box into the world's most flexible router. Graham Morrison explains how.

OU'LL NEED THIS

A LINUX PC

A modest Linux PC with two thernet ports, one of which s connected to the internet and the other connected to the rest of your network.

CLEAROS

ou'll also need a copy of the ClearOS Linux distribution, burned onto DVD, to install on it. Download it from ww.clearfoundation.com.

The latest, most expensive routers include so many facilities you'd be forgiven for thinking that they're more like PCs than tools for networking. This thought should lead you to wonder why you can't use a regular PC to do the same thing. The answer, thanks to Linux, is you can, and it's very easy.

There are many different Linux distributions designed specifically to turn your machine into a router or a gateway, complete with any number of enhancements. Our favourite is called ClearOS (**www.clearfoundation.com**). It's a fantastic choice of router for your network because it's relatively painless to configure, but it's also extendible, taking it far beyond even the most ambitious devices from the likes of Netgear. You could use it to host your cloud documents, complete with editing; host and access your email, either through a web interface or server; as well as a powerful firewall and intrusion detection.

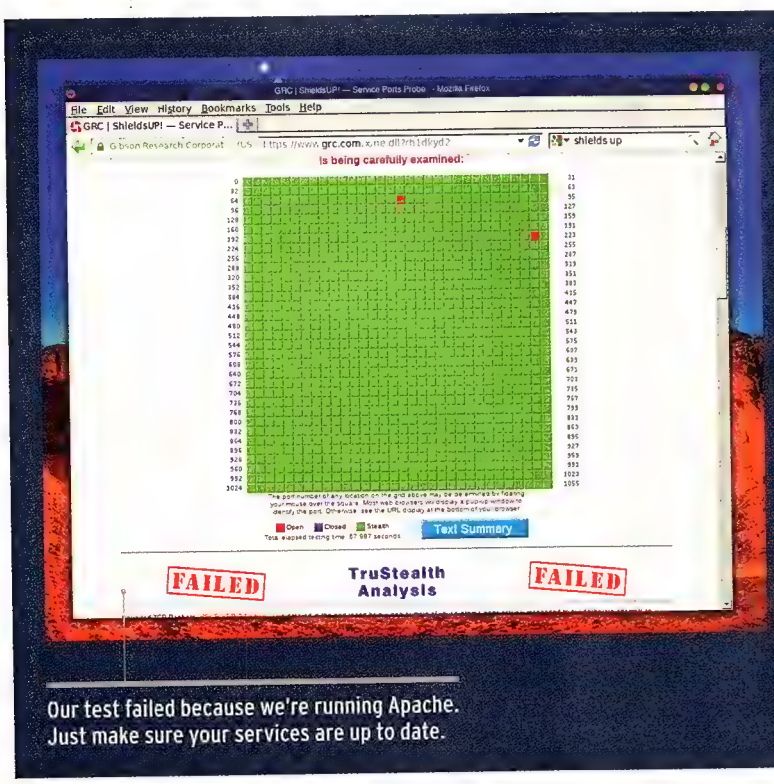
ClearOS is unlike most Linux distributions because it offers both a free edition and a commercial edition that you have to pay for. Because some people do pay for it, ClearOS has one of the better user interfaces, and most of its facilities can be installed and configured through a web app. It's also easy to install and has a great support network. This is important because all of your network's data is going to go through it and you need to trust both the integrity of the packages and services it's running, along with the source of those packages and the distribution itself. Fortunately, ClearOS's heritage couldn't be any better, as it's based on the billion-dollar Red Hat enterprise.

STEP 1: INSTALLATION

ClearOS uses Red Hat's graphical installer and asks you only a few questions. Boot your machine with the ClearOS DVD in the drive (a USB option is also available) and select the first option from the boot menu: 'Install or upgrade an existing system'. The graphical installer will appear after a few moments and you'll have to answer the usual questions about language and keyboard layout. After these are out of the way, choose 'Basic storage device' as your installation medium and step through the regular drive and partition options. The next few questions deal with the network and where you're located, before asking how you'd like to allocate space on your drives. The default values will choose a drive and create an installation automatically, but be warned: this will remove all data from the drive it chooses. The following two questions will confirm your choices before the installer goes off and does some installing. When this has finished, you get the chance to reboot into your new installation, so remove the DVD at this point.

STEP 2: CONFIGURATION

When your machine has booted, the first thing you'll notice is the lack of a desktop. In fact, the only thing you should see is a screen telling you the IP address of your machine and where to get further information. This is because, like any modern router, ClearOS is intended to be configured through a web browser. A fter you've made a note of its IP address, you can disconnect any screen, keyboard and mouse, and hide the machine under the floorboards if you like.

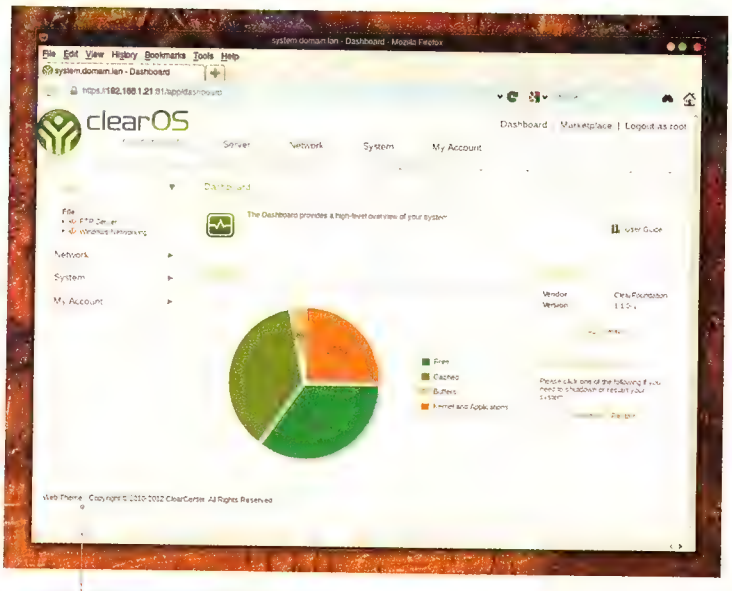


Our test failed because we're running Apache. Just make sure your services are up to date.

TESTING YOUR NETWORK'S SECURITY

As you're messing around with firewall configuration and port forwarding, it's worth making sure you don't leave any obvious holes open that hackers can exploit. You can't do this from within your own network because most ports should be open to machines on your LAN, so you'll need to test security from a machine out on the internet. If you have command line access to this remote machine, we'd recommend using a tool called Nmap (**nmap.org**) to scan the IP address of your gateway. This will tell you which ports are visible and which services are running on those ports, as well as whether you should consider closing them.

If you don't have access to a remote server, the best alternative is to use a free service like ShieldsUP! from Gibson Research Corporation (**www.grc.com**). This will scan your IP address and list any ports it finds open. After getting to the main site, select 'All service ports' from the service list. This will probe the first 1,056 ports on your server and you'll need to wait a few minutes while each port is tested in turn. Be warned, this may trigger any security software you're running because it's the same kind of scan a hacker will use to try to find vulnerabilities. You'll see a list of green secure ports and red where an open port has been detected.



ClearOS is configured and managed through its own web interface.

As long as it's connected to the network, you'll be able to change the settings. Go to a browser on a machine on the same network and type in that IP address, using both the 'https' prefix and the port '81'. For our network, we typed in **https://192.168.1.21:81** .

The page that appears will ask you to log in and you'll need to enter a username of **root** followed by the password requested by the installer. You'll then be presented with the first page of the ClearOS startup wizard. Click 'Next' and you'll be asked which kind of network mode you want to configure. Which one you choose will depend on how you want to use your new router. The best option is to select 'Gateway Mode', but this won't appear unless you have two network adapters installed: one connected to the internet and the other to your LAN. If you'd rather experiment with ClearOS as a server, choose one of the two other options. After selecting 'Gateway Mode', you need to tell the wizard which adapter is which. The installer makes a pretty good guess at this, marking one as 'External' and the other as 'LAN', although you can change the assignment if it's wrong using the 'Edit' button. The next question asks for a DNS and we'd recommend entering the IP address of either your ISP, Google (8.8.8.8) or OpenDNS (208.67.222.222). After that, make sure the free community edition is selected and click 'Next' to download and install any critical updates.

STEP 3: MARKETPLACE

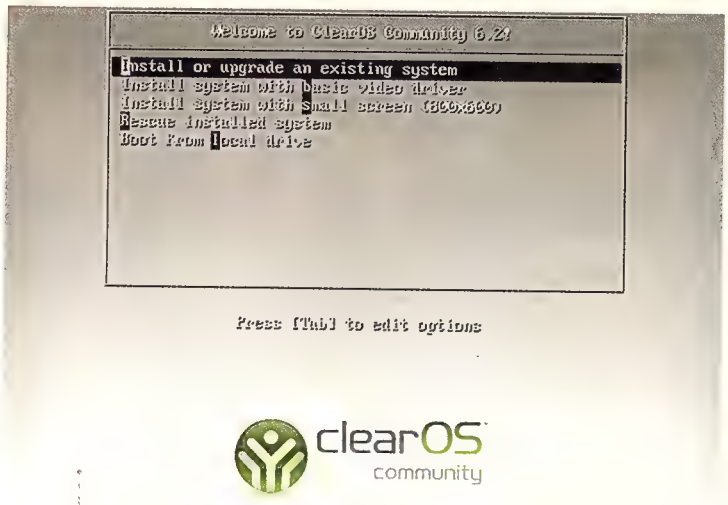
One of the best things about ClearOS is a package manager it calls the Marketplace, and the next step of the installation is to create an account to access this. You'll be asked for an email address and be instructed to register your system with your new credentials.

You'll then be asked a couple of questions about domain names for your connection. If this is a home connection, you might not have one. We'd recommend using a free dynamic DNS service to get yourself one. Otherwise, you can always use a made-up name or the default values as a temporary fix.

You can then start installing applications. To begin with, we'd recommend selecting the Windows file server, the bandwidth manager, port forwarding and the FTP server, but you can always come back at a later time and install more applications. After making your selection, click on the 'Download and install' button. This will automatically grab

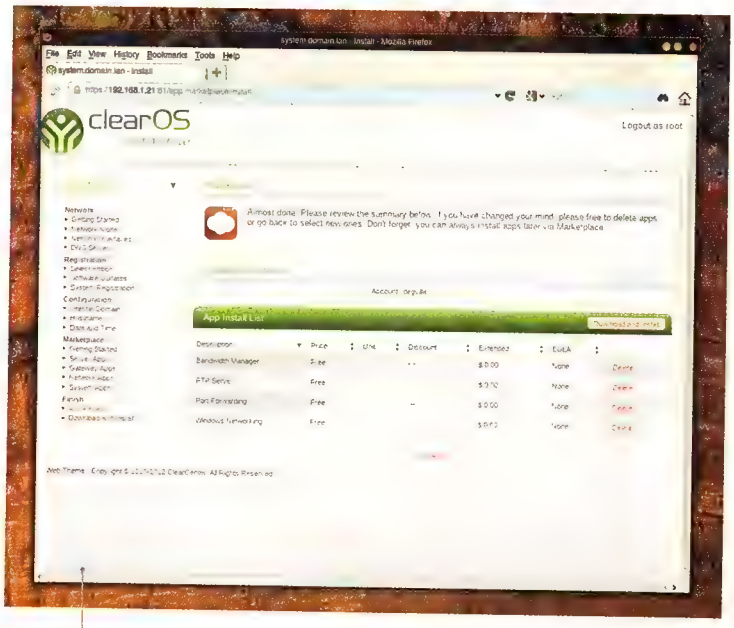
LVM

The default partitioning scheme in ClearOS uses LVM. This is a great option because it allows you to add storage and resize partitions without having to copy data from your drives.

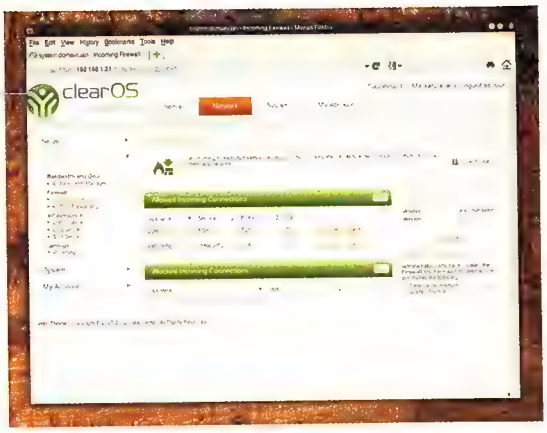


ClearOS uses Red Hat's installer, which works by asking a few questions.

The best network setup option to use is 'Gateway Mode'.



The Marketplace package manager makes adding applications very simple.



The firewall's 'Add' interface includes a list of the most common services.

and install all the packages you've selected. A few minutes later, depending on the speed of your connection, you'll be presented with the ClearOS dashboard and you'll be able to start using your new gateway.

STEP 4: FIREWALL

A gateway with a firewall acts as a permissive barrier between two networks. In our case, that's between the internet and your local network. It's a necessary precaution because the internet is saturated with systems that constantly bombard every connection with random requests directed at ports with known vulnerabilities. Most of these vulnerabilities are found on non-updated versions of Windows, but they can also be found within almost any network-facing service, such as a web server or file server.

Within ClearOS, the firewall can be configured by clicking on the 'Network' menu on the left or top of the dashboard, followed by 'Incoming Firewall'. By default, there should already be a single defined rule called 'webconfig'. This allows port 81 on the oncoming connection, which is the port you need to access the ClearOS web interface. This rule means you can configure your gateway from the internet and if you don't want this facility, click on 'disable' for the rule. To add your own rule, click 'Add'. You don't need to memorise most port numbers because the 'Add' interface includes a list of the most common services. Select 'SSH', for example, and click on 'Add' again. The rule list will then include SSH running on port 22, which is its default port. If you need to add custom ports for your own services (or games), this can be done from the same interface.

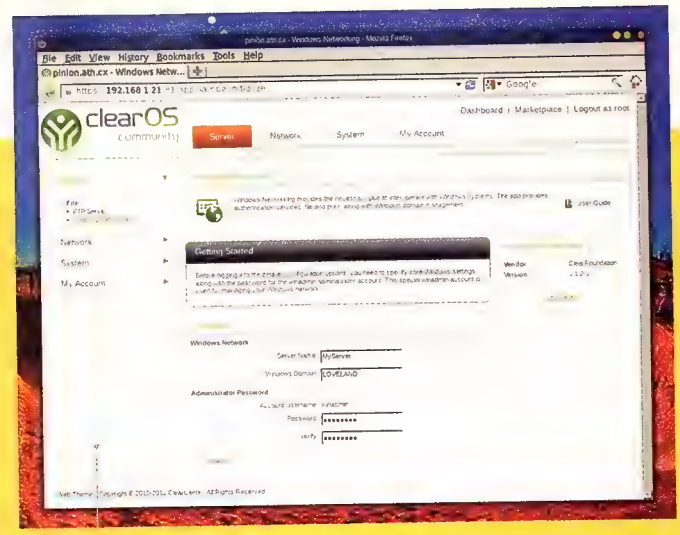
ClearOS runs an SSH server, which is all you need if you want command line access, but you may also want command line access to another machine on your network. To do this, you'll need to use port forwarding. This takes an incoming connection on one port – 22 in the case of SSH – and maps this to a different port on either a local machine or another machine within your LAN. Click on 'Port forwarding' and then 'Add'. You'll be able to select a standard service in the same way you could for the firewall, but you'll also need to add a local IP address. This will be the destination for the port. You can forward custom ports, a range of ports, and choose between UDP and TCP protocols by using the other options on the page.

STEP 5: SETTING QOS

The other feature you only find in advanced routers is the ability to limit the connection bandwidth going through your router depending on what they're doing. This is often known as QoS (Quality of Service) because it's often used to make sure time-sensitive data isn't affected by a torrent download, for example. Time-sensitive data could be streaming video or VoIP, where getting packets to the client is important. File downloads aren't normally affected by some delay.

When you select 'Bandwidth manager', you have two choices. The first deals with bandwidth limiting on an interface, while the second can limit bandwidth by service. The first is useful if you have several subnets, such as a wireless host running on your gateway. You can either restrict data coming into and out of this network, or restrict the other interfaces, so you can ensure there's always a decent amount of bandwidth.

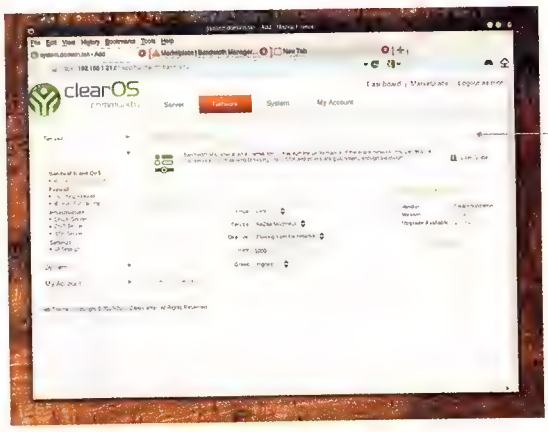
The 'Basic Rules' table is the most useful for the majority of networks because it allows you to promote those first-class services while still allowing people to download large files. Click on 'Add' and you'll get the option to choose a service (like SIP or FTP) and specify whether you want the bandwidth limited or reserved, in which direction and at what rate. To ensure SPI always gets 1Mbps, for example, choose 'Reserve', 'SIP', 'Flowing to the network' and set a rate of 1,000 (the rate is set in Kbps). If you have local users saturating your upstream bandwidth, change 'Flowing to the network' to 'Flowing from the network'. ClearOS will transparently limit the packets going through the network to ensure the services you depend upon will have the lion's share of your bandwidth. And unlike some ISPs we could mention, you're in control of whether that's BitTorrent or HTTP, which is the best thing about running your own gateway.



After you've enabled OpenLDAP, both FTP and Windows File Sharing will work automatically.

ENABLE FILE SHARING

As we've built a router from a Linux box, we can augment it with lots of the things you may want to install on Linux. The first thing you may want to look at is file sharing. Many advanced routers now offer this, either through external USB devices or even with an internal drive. As we installed both the Windows File Sharing application and FTP when we installed ClearOS, you should already see them listed in the 'Server' menu of the web interface. Click 'Windows Networking' and you'll see the option to either enable 'Active Directory' or 'OpenLDAP', both of which are used to manage users and what they can access. 'Active Directory' should be selected in an office environment with other Windows machines and 'OpenLDAP' if you're running your server at home. We'd recommend the latter for most installations and after it's enabled, you'll need to enter a server name and a Windows domain. The Windows domain should be the same as the one your Windows or Linux network is using, which often defaults to 'WORKGROUP'. Follow this by adding a password and then click the 'Initialize' button. This will create the configuration and run the service, and you'll be able to see your gateway as a SAMBA source in Windows, Mac OS X and Linux machines.



Ensure the services you depend upon gets the lion's share of your bandwidth.

NEW SERIES: PART 1

Make your own hardware

It's possible to create your own PC-programmable microcontrollers that sense the environment through various sensor and control devices such as lights and motors. In this new masterclass, Darren Yates shows you how to do it.

IN THIS SERIES

This masterclass shows you how to use the low-cost Arduino microcontroller board system .

APC EXPERT

DARREN YATES

Darren is a multi-award-winning journalist who started building and testing computers in the early '90s. He's developed a range of PC software, including *PC User*'s UserBench benchmark series starting in 2005, its UserOS Linux distros in 2008 and is now working on new benchmarks for Android when he's not busy writing or torturing hardware with his soldering iron.

The world is going nuts over the Raspberry Pi single-board computer (SBC) for being a whole system under $50.

In reality, though, the Pi isn't actually the cheapest computing device available. If you want really cheap, how does $13.50 sound for a mini computer that can plug into your PC's USB port, be programmed in C++ and let loose into the real world connected to all sorts of crazy stuff? Welcome to the world of the PC-programmable microcontrollers.

SO WHAT'S A MICROCONTROLLER?

CPUs are the show ponies of the computing world – they strut around showing off their high clock speeds, but on their own they're totally useless: they need a whole motherboard's worth of bits to connect to real-world devices.

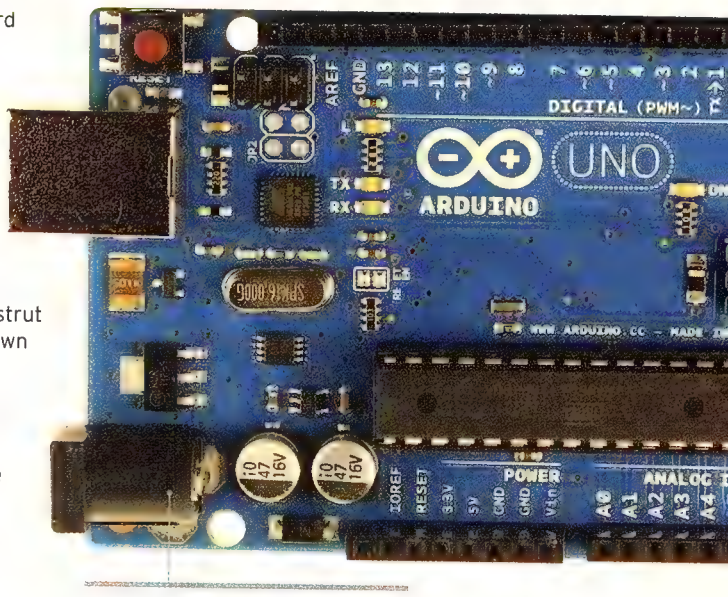
On the other hand, microcontrollers are compact self-contained bite-size devices that run their own complete computing device – they have storage, RAM and interface ports that work with sensors, displays and switches. They run everything from fridges to cars and clock radios.

Microcontrollers don't run anywhere near as fast as CPUs – the ones we'll look at only clock at 16MHz – but they're not encumbered by layers of Windows operating system to strangle the life out of them either.

INTRODUCING ARDUINO

Microcontrollers allow you to create complex gadgets at a fraction of the cost of using individual or discrete integrated circuits. However, if you're going to use microcontrollers, a good working knowledge of electronics is required – this series is all about real-world computing in the truest sense.

Yep, we'll talk electronics theory, get our inner geek on and look at voltages, currents, resistors and the like. But frankly, I get bored with theory alone damn quick, so this series will be all about getting your hands dirty and building stuff. And to do that as quickly as possible, we're going to use the excellent Arduino series of expandable microcontroller boards.



Arduino Uno R3, the microcontroller board we'll be using in this series.

Arduino was created in 2005 by two Italian engineers, Massimo Banzi and David Cuartielles, with the goal of making it easier for students to learn how to program, and grow their understanding of electronics and use it in the real world.

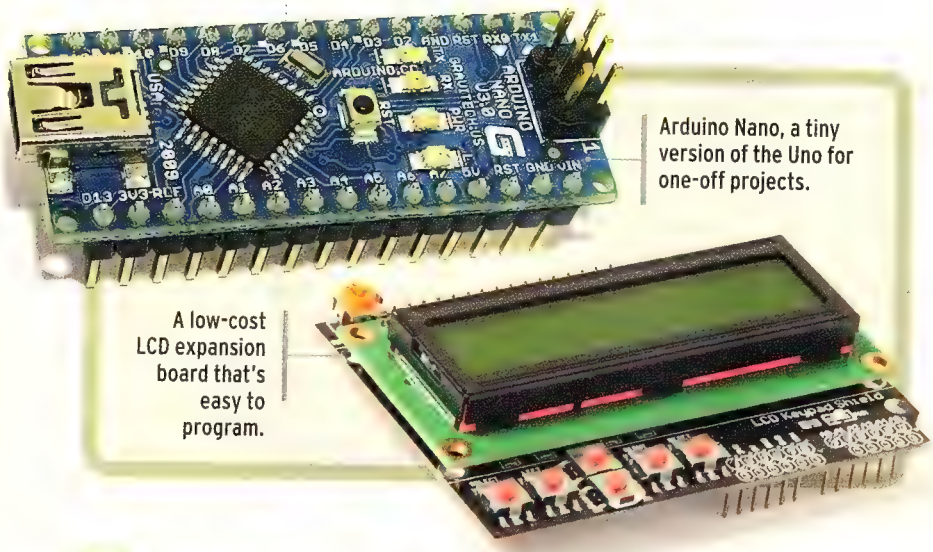
Today, 300,000 boards later, Arduino has grown into a highly expandable system of low-cost microcontroller boards that can be used to build everything from electronic dice to web servers. Arduino boards plug in to your PC via USB and you program them using the free Arduino integrated development environment available from **arduino.cc**.

WHAT'S INSIDE?

There are several different Arduino boards and many more third-party compatible versions available, the most common official ones being the Arduino Uno R3 and the Arduino Nano V3. Both of these run a 16MHz Atmel ATmega328P 8-bit microcontroller with 32KB of flash RAM, 14 digital I/O and six analogue I/O. While 32KB doesn't sound like much, we're not running Windows – you don't need as much as you think and you can easily add microSD/SD card storage for bigger tasks.

You can buy the Australian-designed Arduino Uno R3-compatible Freetronics Eleven from Jaycar for $40 or pick up Chinese equivalents for under $20 on eBay. For less complex one-off projects, eBay has tiny Arduino Nano V3-compatible boards with the same controller, USB connectivity and I/O count for just $13.50, including shipping.

OK, enough talk – let's build something!



Arduino Nano, a tiny version of the Uno for one-off projects.

A low-cost LCD expansion board that's easy to program.

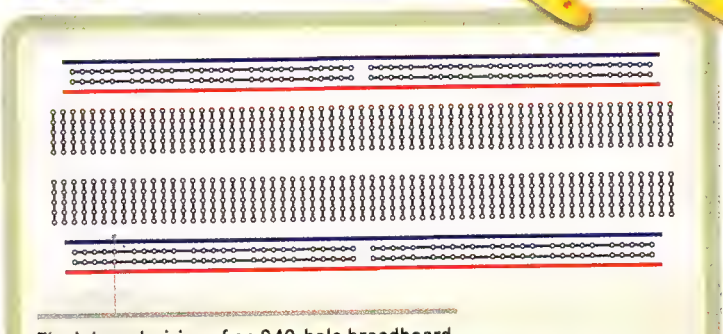
Long-nose pliers and a pair of side cutters will come in handy.

Hardware: What you'll need

If you've never built anything with electronics before, the best way to learn is by doing. Each project we do will have a specific parts list, but you'll also need a basic set of tools you'll use for everything, available from Jaycar Electronics or elsewhere online.

- An Arduino Uno R3 board (eBay, $18 or Jaycar XC4210, $39.95)
- An 840-hole breadboard ($19.95, Jaycar PB8814)
- Breadboard jumper kit ($11.95, Jaycar PB8850)
- Auto-ranging digital multimeter ($19.95, Jaycar QM1524)
- A pair of long-nose pliers ($11.95, Jaycar TH1893)
- A pair of side cutters ($11.95, Jaycar TH1890)

For the time being, we won't do any soldering and the only power required will be a USB port or a USB power brick, which greatly reduces the chances of you blowing yourself up.



The internal wiring of an 840-hole breadboard.

A digital multimeter is a useful bit of gear to have around.

HOW BREADBOARDS WORK

Most electrical engineers go weak at the knees when they see a breadboard – it's like a blank canvas to a painter. It's a reusable plug-in board that lets you create electronic circuits without having to solder. The one we're using has three sections: two horizontal row sections, top and bottom, and a main centre section. The holes at the top and bottom are connected horizontally, each row separate from the other with a gap between the two halves. The centre section pins are connected vertically in columns separated by the horizontal well in the middle.

USING YOUR MULTIMETER

A digital multimeter (DMM) allows you to measure stuff – electrical voltage across components, electrical current through circuits, as well as the electrical resistance of components. We recommend an auto-ranging DMM, which means all you have to do is simply select volts, current or resistance – you don't have to also select the correct meter range to read the result. DMMs come with leads – the black one plugs into the COM socket and the red one into either the 10A socket or volts/ohms socket as appropriate.

Just quickly, the reason for the two sockets for the red lead is because you measure the current *through* a circuit and the voltagea *across* or resistance *of* a component or device. You don't want the meter to affect the circuit you're measuring, so the 10A current socket has very, very low resistance (or impedance), so it doesn't affect current flow while the volts/ohms socket has a very high impedance so as not to change or load down the component or voltage you're trying to measure.

And finally, never use a multimeter to try to measure the resistance of a component while the circuit is powered up – at best, the reading will be wrong and at worst, you'll blow up the meter and/or the component you're trying to measure. Ideally, you want to measure resistance in isolation to everything else.

MEASURING RESISTORS

For this month's project, you'll need seven 680-ohm resistors. Resistors use a special colour code (**tinyurl.com/rescode**) to identify their value, displayed by a series of tiny coloured bands on the body. In theory, they should be enough to work out the resistor value. The problem is that most resistors now have very thin colour bands and a base background colour that makes them hard to read.

So to be sure, measure resistors with your multimeter. Switch the meter to ohms, put the red lead into the volts/ohms socket, connect one lead to one side of the resistor and the other lead to the other side. Don't hold the ends of the both leads with your fingers because with higher resistor values, your skin's own resistance will alter the reading.

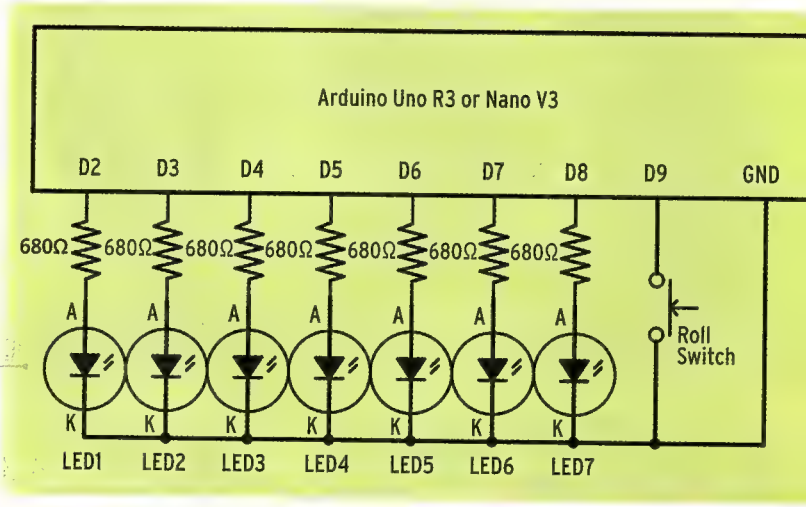
Any serious geek worth their salt learns the resistor colour code by heart, but measuring a resistor is the most reliable way to know its value.

Let's look at how it all comes together by building our electronic die.

PROJECT 1 Electronic die

Learn the basics of programming your Arduino with our simple electronic die project.

Tech law says that when you're programming something for the first time, you must do the 'Hello world' app. In Arduino land, this is flashing the Arduino's programmable light-emitting diode (LED) on and off. Bah! Why flash one LED when you can flash seven? So I've designed an electronic die. The circuit is completely unoriginal, but the special sauce is in the programming.



The basic circuit of our LED die.

The wiring diagram for our LED die project.

CIRCUIT & WIRING DIAGRAM

The circuit diagram for our LED die shows you at a glance how it's wired up, while the wiring diagram shows you how we actually did it on the breadboard.

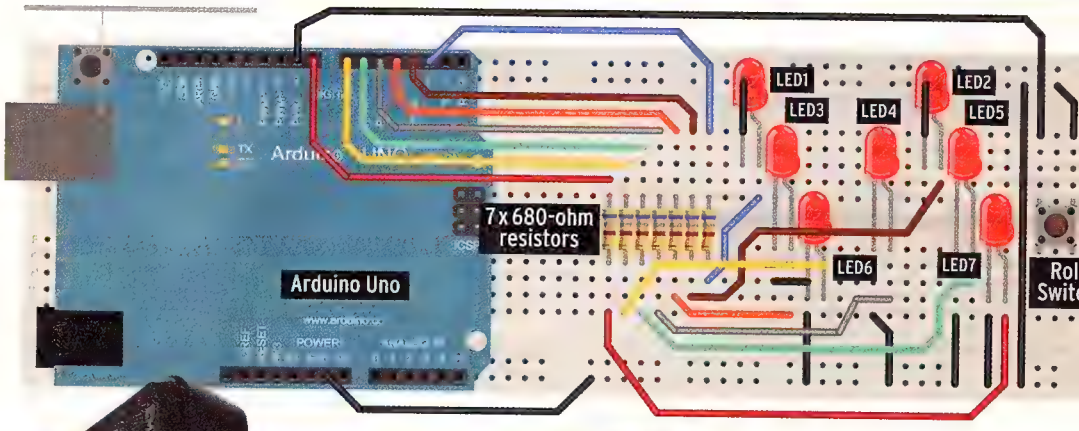
Start off by installing the seven resistors and LEDs into the board. Resistors don't have polarity, which means they can go in either way around. LEDs are different and ours have two pins: one called an anode (A), the other a cathode (K). Look down at the top of the LED and one side will have a flat edge on it – that's the cathode pin.

Follow the wiring diagram to build the circuit and take your time. We've used colour-coding on our big wiring diagram just to make it easier to see – provided each wire is connected to the right location, you can use whatever colours you want.

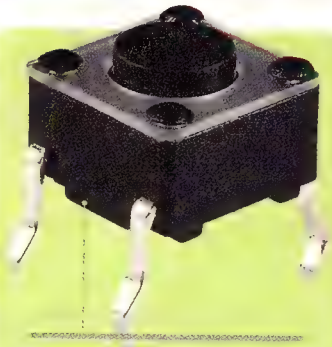
INSTALLING THE SWITCH

The PCB-mount switch has little kinks in its pins. You'll need to carefully flatten them out by squeezing them with your long-nose pliers and then it should press into the breadboard fairly easily. One trick though, press on the outer edge of the switch shell rather than the button itself, just to ensure you don't damage it. As for the wires, you'll need to bend them to get them into the Arduino's jumper sockets, but again, take your time – getting the wiring right now will save you hassles later on.

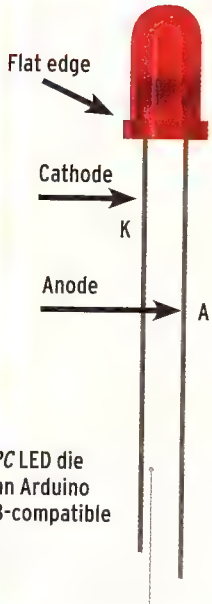
When you're done, all that's left is to load our *APC* LED die software into the Arduino itself.



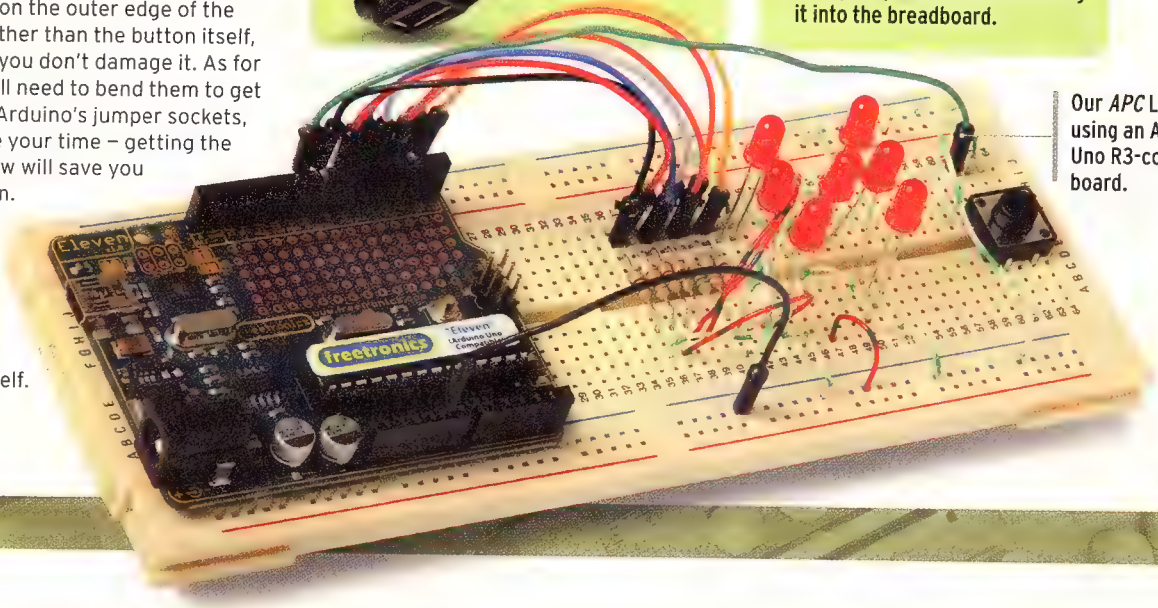
This $3 USB emergency charger from eBay can power your LED die.



Straighten the PCB switch pins with your pliers before inserting it into the breadboard.



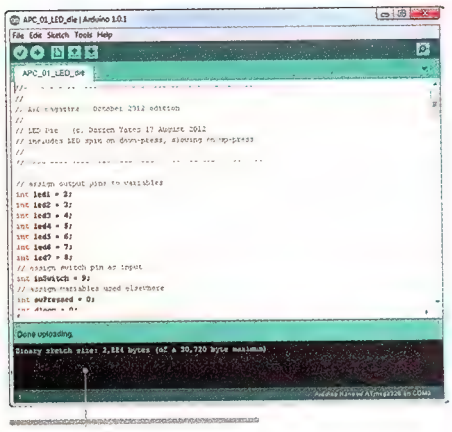
This is how you identify the pins of an LED.



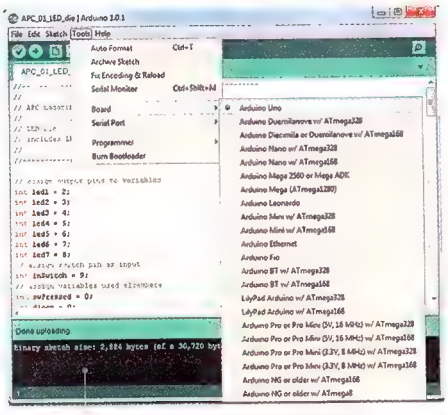
Our *APC* LED die using an Arduino Uno R3-compatible board.

Programming the Arduino

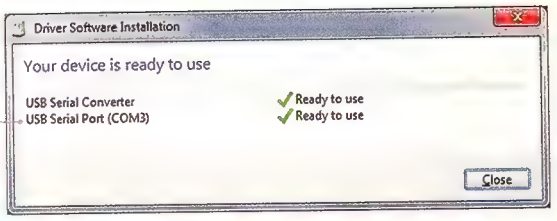
Windows will auto-download and install drivers for your Arduino board.

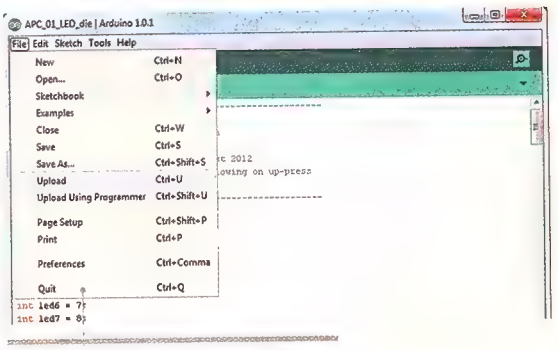


The free Arduino Integrated Development Environment.



You must select the Arduino board and COM port to program it correctly.





Select 'File > Upload' to compile your sketch and install it on your Arduino.

Once you've got the hardware sorted out, it's time to program your Arduino. So far we've talked about apps and programming – in Arduino, apps are known as sketches and we'll use this term from now on.

To load a sketch into your Arduino, grab the Arduino IDE (version 1.0.1) from **arduino.cc/en/Main/Software**. There are Windows, Linux and Mac OS X versions, but we'll use the Windows version for simplicity.

Unzip the archive and launch the 'arduino.exe' file. Download our *APC* sketch from **apcmag.com/arduino.html**. Unzip the file to a folder, head back to the Arduino IDE and from the top menu, choose 'File > Open', navigate to the sketch folder and load in the 'APC_01_LED_die.ino' file.

Next, plug your Arduino into your PC via a spare gUSB port. You'll find the .INF driver software for Arduino-compatible boards in the \arduino\drivers\ folder, although Freetronics Eleven boards need a driver .INF file from **tinyurl.com/7cedl5o**. When installed, Windows will assign a COM port to it – note the number of that port. In the IDE menu, select 'Tools > Board' and choose your Arduino type.

Our project sketch works happily with Arduino Uno and Arduino Nano w/ ATmega328-compatible boards – choose the appropriate option . Next, select 'Board > Serial Port' and the COM port from the driver installation.

PROJECT-SPECIFIC PARTS

Aside from the basics, you'll need these extras:

- 7 x 680-ohm 0.5W resistors (Jaycar RR0568, eight pack)
- 7 x 5mm red LEDs (Jaycar ZD0150) or green LEDs (ZD0170)
- Single-pole single-throw (SPST) PCB mount switch (Jaycar SP0608)

All up, the cost should be less than $5.

COMPILING YOUR SKETCH

Now is the moment of truth – you've checked your wiring against the diagram, you've installed the driver, loaded up the sketch into the Arduino and you're ready to upload it to the board. In the IDE, go to 'File > Upload'. This will compile your sketch into code and if there are no errors, it'll upload to your Arduino's flash memory. Provided you've followed the wiring precisely, the LED die sketch should start operating. It only uses about 3KB of the 30KB or so of storage, so we can create much larger sketches.

TECH CORNER

Calculating the resistors

When you power up an LED, it develops a voltage across it called its forward voltage (Vf), which is relatively independent of the current going through it (If). However, LEDs have no way of limiting the current flow, so without some control mechanism they'll blow up. That's where the resistors come in. These red LEDs have a Vf of 2V and only need roughly 5mA of current to light up clearly. Since our supply voltage (Vcc) for this circuit is the USB port's 5V, we can work out the resistor value needed:

RLED = (Vcc -- Vf) / If = (5 -- 2) / 0.005 = 600-ohms

You can't buy 600-ohm resistors easily, but given the current doesn't have to be precise, we've chosen 680-ohm resistors instead. You can work out the current this resistor value allows by rearranging Ohm's Law:

If = (Vcc -- Vf) / RLED = (5 -- 2) / 680 = 0.0044 (4.4mA)

4.4mA is perfectly fine for each LED and poses no problem for the Arduino.

HOW ARDUINO SKETCHES RUN

We'll look at this further next time, but just briefly, Arduino sketches have two compulsory procedures: `setup()` and `loop()` . The `setup()` procedure runs once as soon as the board is powered up. After that, it drops into the appropriately named `loop()` procedure and runs around that infinitely until the power is removed. You can create your own procedures, although they must be referenced in either the `setup()` or `loop()` procedures, otherwise they'll never run.

HOW OUR LED DIE WORKS

The first thing our electronic die does when it boots is light up all seven LEDs for two seconds to allow you to check your wiring. This is done in the `setup()` procedure, as we only need to do it once. After that, it runs the main `loop()` procedure, which starts with flashing the middle LED briefly twice a second to indicate that it's ready to roll.

Press and hold the button, and the animated rolling sequence will begin – you'll see each outer LED flash alternately to simulate rolling. When you let the button go, the LEDs will flash up in random die numbers at a slowing rate until it settles on the final number. The final number will stay lit for three seconds before it blanks and goes back to flashing the centre LED again, indicating it's ready for the next 'roll'.

HAVE A PLAY!

Provided you don't change the Arduino pin assignment, feel free to play with the sketch code. You'll find plenty of comments in the code to tell you what's going on, so have a play and see what happens. Check out the **arduino.cc** web site for helpful info and we'll see you next time!

SINGLE-BOARD COMPUTERS

Dual-core Android 4.0 sticks under $80

The Raspberry Pi receives a new 1GHz Turbo Mode update while cheap new Android computer sticks hit the market with dual-core CPUs. Darren Yates reports.

The Android TV Cloud Stick, a mini PC for under $50 on eBay.

The MK808 combines Rockchip's dual-core RK3066 CPU with Android 4.1.

The UG802, the first dual-core mini PC with Android 4.0.

The original Android mini PC, the MK802, sells for under $50.

APC EXPERT

DARREN YATES

Darren reckons he's reviewed around 2,000 computers since 1995, but even he hasn't seen computers this cheap since the mid-'80s.

It's incredible how fast the single-board computer (SBC) market is moving, no doubt helped by its considerably lower setup costs for manufacturers compared with laptops, tablets and even desktop technology.

Taking a leaf out of the Raspberry Pi's book, one enterprising eBay seller is offering a board-only version of one of the 1GHz Allwinner A10 CPU-based Android 4.0 TV sticks for under $38 including shipping to Australia, selling it cheekily as an 'Android 4.0 Development Kit'. With a 4GB flash ROM and 1GB of RAM, HDMI plug, microSD card slot and two USB ports, it's cheaper than a Raspberry Pi.

If you're after a more traditional encased Android stick mini PC, prices are seeing plenty of downward pressure, with the Android TV Dongle and the MK802 selling for under $50 from eBay sellers. The Android TV Dongle is the cheapest of a new breed featuring a built-in full-sized HDMI plug rather than the MK802's miniHDMI socket. Most sellers include a short extension lead, which is a good idea to lessen pressure on your monitor or TV's HDMI socket. Just check before you buy. Running a 1GHz Telechips TCC8925 ARM v7 CPU, it also comes with 512MB of RAM and 4GB of flash ROM, plus the standard two USB ports and microSD card expansion. Even Intel has announced its own SBC computer (see page 17)!

DUAL-CORE ANDROID STICKS UNDER $80

The reign of these single-core computer sticks could well be short-lived as the first dual-core offerings begin hitting eBay for as little as $75. The UG802 is about the size of the MK802, but with a honeycombed casework to allow better internal airflow, a full-sized HDMI plug, built-in 802.11b/g/n Wi-Fi adapter, 1GB of RAM, 4GB of flash ROM, USB host port and a miniUSB port for power. Throw in the microSD card slot and Android 4.0.4 operating system, and it sounds impressive.

It's powered by Rockchip's recently released RK3066 dual-core ARM v7 processor, appearing in some budget tablets clocking at 1.6GHz, although only 1.2GHz in these devices. The 400MHz Mali400 graphics engine has long been popular in Chinese-based ARM CPUs; however, the RK3066 features four Mali400 cores running at 250MHz.

Reports are that the chips cost $15 each in quantity, but they're well stocked in the features department with a 1080p multiformat video decoder plus 1080p video encoding support for H.264 and VP8 (Google WebM) encoding. What's more, the HDMI 1.4a-standard support is needed because the chip can do 3D video output plus dual-screen output.

Before you start hunting down a UG802, though, the next-generation replacement for the MK802/II has just been launched. Called the MK808, this computer stick is the first to not only feature the dual-core RK3066 processor, also but Android 4.1 (Jelly Bean), and it sells for as little as $85. Like the MK802, the new MK808 includes a miniHDMI socket rather than a full-sized plug, but depending on the eBay seller, you'll also get a miniHDMI-to-HDMI converter cable. The device isn't rooted by default, although there's a fix for that problem (**tinyurl.com/cr2rpcs**). However, unlike Allwinner, Rockchip isn't known for its Linux support, so don't expect to run Ubuntu any time soon.

QUAD-CORE STICKS ARE COMING

If you want any further proof of the speed of this market, expect to see quad-core sticks (or at least portable drive-size computers) hitting the web before the end of the year. Both Allwinner and Rockchip are expected to have quad-core ARM v7 CPUs sometime this month. The speculation is Rockchip's RK32xx model will have similar performance to Samsung's Exynos 4412 and Nvidia's Tegra 3 quad-core chips – that's Samsung Galaxy S III territory. If Rockchip pulls it off, these devices will provide yet another challenge to desktop/laptop computing simply through their incredible performance-per-dollar rating.

Overclock your Raspberry Pi

Android computer stick competition is coming, but the Raspberry Pi fights back with a new Turbo Mode offering up to 1GHz performance. Here's how to get it.

Ever since the Raspberry Pi launched with its stock 700MHz core clock speed, everyone has been looking at how to overclock it. We showed you the simple 'config.txt' overclocking method last month (see *APC* October, page 110), which enables most Pi boards to hit around the 900MHz mark, a better than 25% increase. To get beyond that, however, you need to over-volt the BCM2835 processor, which apart from instantly voiding your warranty, also permanently sets a bit register, enabling the Pi Foundation to know your board has been over-volted, should it ever return for a warranty claim.

This month, the Pi Foundation has announced a new firmware and new performance set called Turbo Mode, which 'dynamically enables overclock and over-volt under the control of a cpufreq driver, without affecting your warranty' according to a recent Pi Foundation blog post.

The system works by offering five overclock settings, the top one running the Pi at 1GHz. The firmware also automatically limits the overclock function when the internal core temperature hits 85°C. The Pi Foundation believes with that temp limit in place, there'll be no noticeable lifespan reduction as a result of overclocking. Speaking personally, it might be right – at least in the UK, where the Raspberry Pi was developed and the sun rarely shines.

In our warmer Australian climes, though, the Pi could hit that 85°C mark sooner, so I've added a small PGA heatsink array to mine, just to ensure it stays as cool as possible, even at that top overclock.

We benchmarked the overclock using last month's Simple Benchmark, running the following command:

```
Time echo "scale=3000;4*a(1)" | bc -l
```

The new 1GHz Turbo Mode returned a time of 50.48 seconds. The previous best at 900MHz with Raspbian was 60.76 seconds and APC piLinux was 56.06 seconds.

OTHER IMPROVEMENTS

There are some other major improvements in this update announcement, including new out-of-the-box Wi-Fi support, improved analogue audio quality, better USB support, plus clock speed and temperature widgets, so you can monitor your Raspberry Pi on the desktop.

To get the firmware, you need to be using the Raspbian distro. (We're looking into how quickly we can make it available for APC piLinux.) You can either download and install the latest 2012-09-18-Raspbian release from **www.raspberrypi.org/downloads** or if you have an older Raspbian release, fire up your Pi with the Raspbian distro, launch Terminal and run:

```
sudo apt-get update && sudo apt-get install raspberrypi* raspi-config
```

You can set the Turbo Mode choice by running: `sudo raspi-config` .

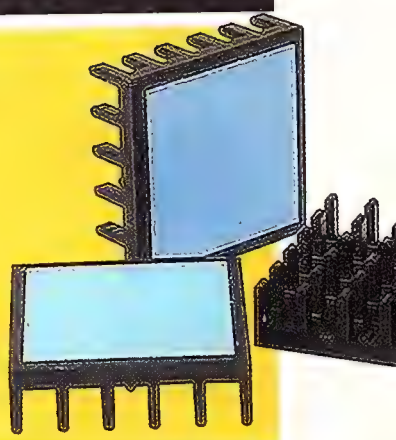
As with the previous 'config.txt' overclock system, there are some serious performance gains to be had, but as with all overclocking, the maximum clock speed is a function of your particular Raspberry Pi board – there are no guarantees. Still, you should be able to exceed the stock 700MHz clock rate.

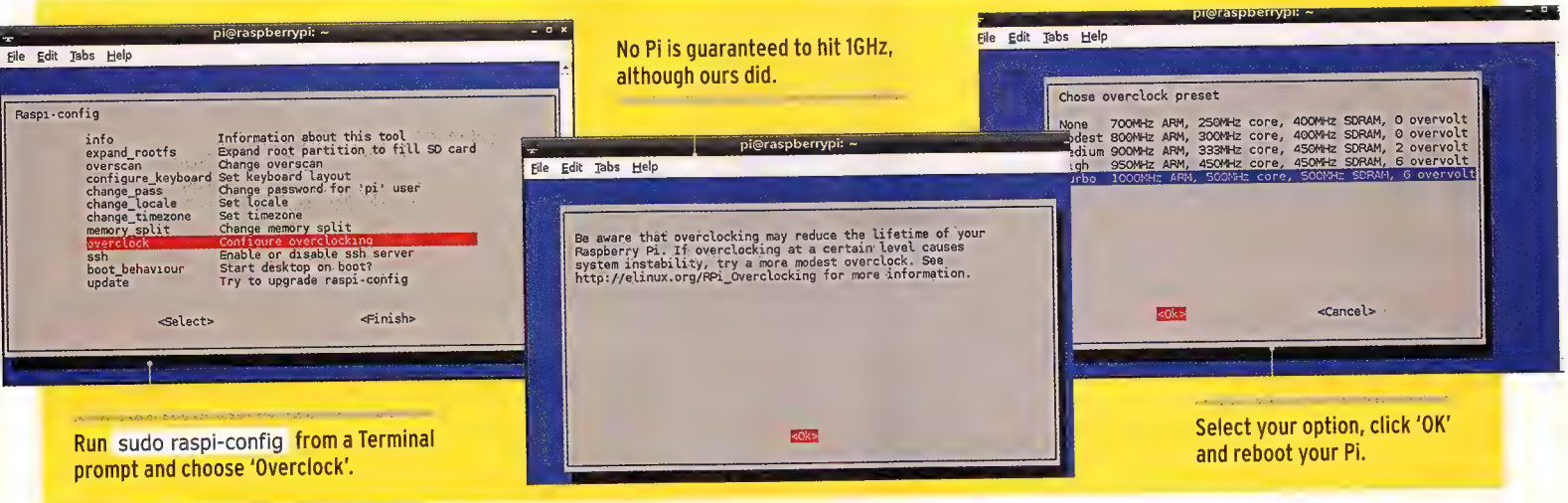
DISABLING OVERCLOCK ON BOOT

If you're struggling to get your Pi to boot because of an overly ambitious overclock setting, you can get the Pi to bypass the overclock for that boot by simply holding down the Shift key as you boot. It's not a permanent bypass – just one for that particular boot, but it allows you to get in and change it to a more suitable level for your particular board.

HEATSINKING YOUR OVERCLOCKED PI

If you're planning on running the new 1GHz Turbo Mode, I'd seriously think about adding a tiny $3 adhesive PGA heatsink from Jaycar Electronics (cat. HH8580). You just pull off the plastic backing and gently yet firmly press it onto the Broadcom BCM2835 processor. Its thermal resistance of 5.9°C per watt should be low enough to ensure the chip stays below 85°C longer and maintains its performance levels, particularly in our hot weather.





No Pi is guaranteed to hit 1GHz, although ours did.

Run `sudo raspi-config` from a Terminal prompt and choose 'Overclock'.

Select your option, click 'OK' and reboot your Pi.

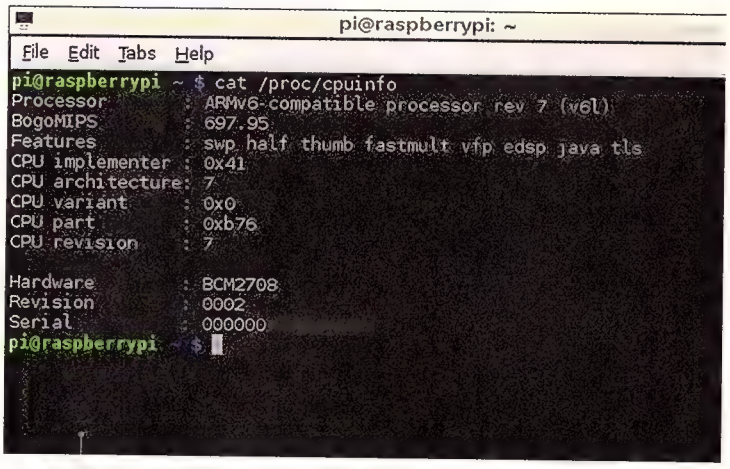
MPEG-2 support for your Pi

The Raspberry Pi Foundation addresses one of the Pi's major shortcomings. We explain how to get it sorted.

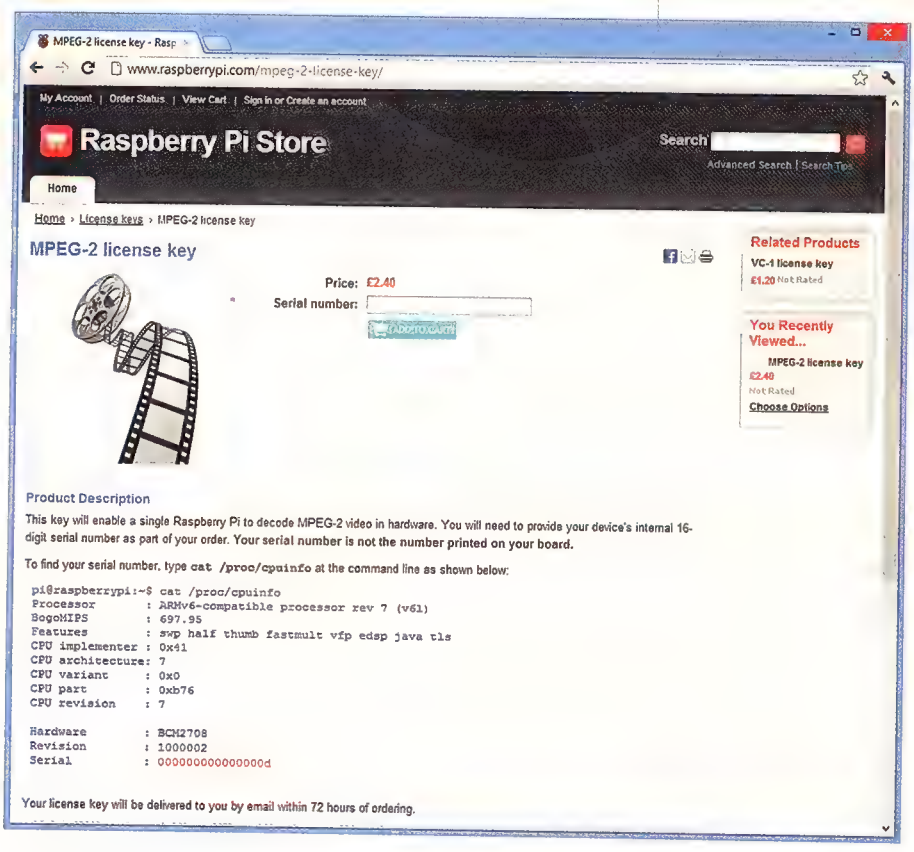
When you're trying to put a computer together for US$25, you clearly have to cut a few corners. However, the Raspberry Pi has managed to do more computing with $25 than any computer in history. Still, that didn't stop plenty of people complaining about one apparently crucial missing feature: the lack of MPEG-2 video playback support.

We reckon the fact that this tiny computer manages to play back 1080p H.264 video remarkably well, let alone at all, is a complete bonus. Still, the technology actually exists in the Broadcom BCM2835 processor. The way these chips work is that you can pay for whichever audio and video codecs you want, and set the appropriate register bit to indicate which codecs are 'switched on'. To keep costs down, the Pi Foundation chose to pay only for AAC audio and H.264 video playback.

However, given the goal of the Pi was actually education rather than home theatre, it's come up with a novel solution: instead of jacking up the price of the board for everyone to include MPEG-2 and VC-1 (Microsoft WMV9) playback, you can pay the licence fees for your particular board at the Raspberry Pi web site at **www.raspberrypi.com**. The cost is in keeping with the Pi itself – you're looking at around $3.50 for MPEG-2 licensing and around $1.80 for VC-1.



Before you buy the MPEG-2 licence, you need your Pi's serial number.



Enter your serial number on the buy page at www.raspberrypi.com.

HOW IT WORKS

The individual licence you buy will be tied to your particular board, which is done through the chip's internal 16-digit serial number. You can grab it by firing up your Pi with any distro, launching Terminal and typing: `cat /proc/cpuinfo` . You'll see the serial line entry in the text. Grab that and load it into the entry box on the buy page.

Although the Raspberry Pi Foundation isn't giving away too much about how it works, you'll be emailed a key within 72 hours, along with information on what to do with it. It's in the public domain (you can read this information from the Raspberry Pi forum at **tinyurl.com/cx9kr5s** and **tinyurl.com/czqr7pz**) that the key is used as a single line of text, along the lines of: `decode_MPEG2=0x12345678` . You add this into a 'config.txt' file (the same one you're using if overclocking).

If you have multiple Raspberry Pi boards, you have to buy a key for each board, but you can make it easier on yourself by loading all of your keys into the one line; for example: `decode_MPEG2=0x12345678,0x87654321` .

Then copy that 'config.txt' file onto all of your SD card boot disks. Because the key is tied to your board's serial number, you can't hack it and just throw anything in there – think of it like Windows activation. Still, if it supports the Raspberry Pi Foundation, why not pay the $3 and be done with it?

Once you've set it up, you need to reboot your Pi and it should then be capable of playing MPEG-2 video files and DVD movies on a USB DVD drive with the appropriate software.

CEC SUPPORT & H.264 ENCODING

We've mentioned raspbmc before as an ideal way to turn your Raspberry Pi into a simple-boot home entertainment system powered by the goodness of XMBC. It turns out that this specific-function distro now supports libCEC.

CEC (consumer electronics control) is a subsection of the HDMI standard that allows one remote to control more than one device through the HDMI chain. For example, you're watching a Blu-ray movie, you turn off your TV via the remote, which also automatically turns off the Blu-ray player – that's CEC at work. You can now do something similar through the libCEC library now built into raspbmc.

And finally, H.264 encoding has been enabled in the latest rpi_update firmware. It turns out that the Raspberry Pi people didn't realise they got the encoder included in the H.264 licence fee. Still, at the time of writing, there weren't any apps that could use it – yet.

Turn the MK802 into a media server

Pack your movies onto a 500GB hard drive and build a home-wide DLNA server with an MK802 computer stick.

You could argue that SBCs like the MK802 wouldn't be anywhere near as popular if it wasn't for the fact that they had Android's 600,000-strong library of apps to play with. These devices are being sold as 'Smart TV enablers', bringing older-generation big-screen TVs into the smart TV era. But it's when you think of them as tiny yet powerful computers that you get a sense of their almost limitless potential.

With its 1GHz single-core Allwinner A10 processor, 1GB of RAM and 4GB of flash storage, the MK802 isn't loaded with space. However, when you combine its NTFS file system support with a 500GB portable drive, you've got all the hardware you need to turn the combination into a very handy DLNA media server that's compatible with the Sony PS3 games console, Western Digital WD TV Live media player and even Windows Media Player (WMP) 11/12.

THE APP

What makes this all work is just one free app called Media Server, which turns the MK802 into a DLNA/UPnP server. You can grab it from Google Play. In fact, Media Server will turn any Android device into a DLNA server, provided it has at least Android 2.2, although the benefit of using it here is that you gain access to USB-attached external storage.

Basically, all you need to do is install it and run it. On your DLNA device or TV, it'll come up as 'MediaServer'. Select it and you should be able to start listing the media files stored on your portable hard drive. The MK802 should support 1080p video even in H.264 format because it's just transferring data – more of a limiting factor will be how high the video bit rate is and whether the 802.11g Wi-Fi adapter can cope with it. Ideally, bit rates should be under 15Mbps if it's going to stream across 802.11g, but closer to 12Mbps would be better.

HARDWARE SETUP

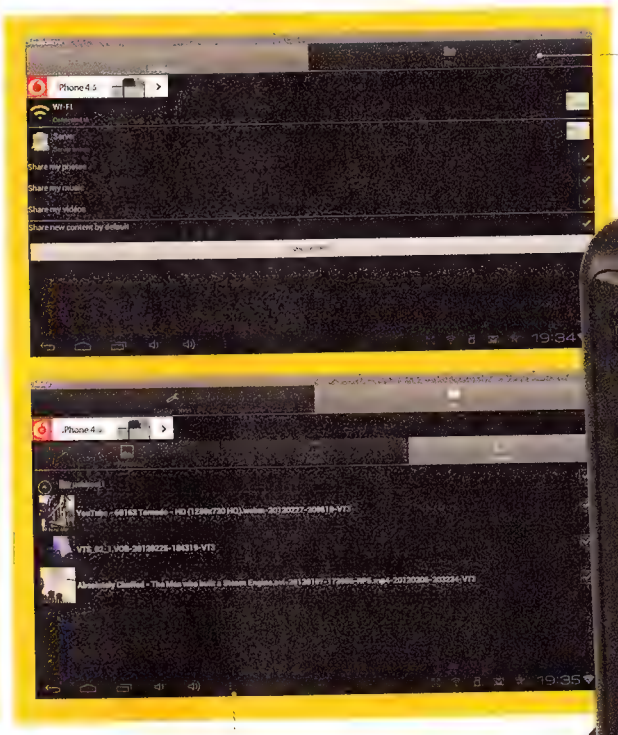
Combine your external storage with the MK802's 802.11g Wi-Fi adapter and you'll almost be able to put this thing anywhere in your home. We've found the Wi-Fi adapter in this SBC to be pretty good and it should happily span a two-storey house, playing 720p-resolution H.264 video. Unfortunately, Media Server doesn't automatically start on boot, but there are likely ways around this.

Given that the software is pretty easy to set up, the most important part of the process is actually getting your hardware right. The MK802 doesn't have the ability to power a portable hard drive on its own, so you'll need a powered USB hub to do the job.

Plug the hub-connecting USB cable into the MK802 to get power and a data connection, and then plug your portable hard drive into the hub. To ensure you don't run into power issues, we'd recommend using at least a 5V/2A power brick, which should be enough to keep a portable drive and the MK802 happy. Use a four-port hub and you've got space for a keyboard and mouse while you set it up.

What's great about this setup is that the MK802 doesn't have to decode the video, it's just feeding the data out through to your network. So provided your DLNA-ready playback device supports the codecs, it should work pretty smoothly.

We tested this using a 2011-era WD TV Live with a D-Link DWA-125 Wi-Fi adapter and had it playing videos from the 500GB portable drive connected to the MK802. You might be thinking: why not just plug the drive into the WD TV Live and be done with it? Using a DLNA server, other devices can also access the hard drive's content at the same time. So it's a way of having your movies accessible to anyone on the network who wants them. apc



Media Server will automatically start the server when you launch the app.

Start the app with your portable hard drive plugged in and it will find your movies.

A good multi-port hub with a 5V/2A power brick will connect and power everything.

WMP supports DLNA/UPnP, so it'll see the server as 'MediaServer'.

PART 4

Easy audio editing with Processing

Jon Thompson uses Processing's Minim audio library to manipulate and synthesise sounds.

IN THIS SERIES

This masterclass covers everything you need to know about editing and manipulating sound for music production, video and listening enjoyment.

YOU'LL NEED THIS

JAVA
The free language of the web. Head to **www.java.com** to download it.

PROCESSING
This is a particularly innovative programming language that suits many creative tasks. Download it from **processing.org/download**.

ECLIPSE
This free, open-source Java programming environment can be found at **www.eclipse.org**.

Processing is a programming language based on Java, but because it's designed to allow creative types to program their ideas quickly, it doesn't insist you write acres of classes and methods to get something on the screen. The Processing environment generates Java, JavaScript and even Android apps. The code it produces is fast, the language is well supported with useful libraries, and it comes with plenty of examples to play with. Here we're going explore its ability to create and manipulate sound using the bundled Minim library.

ANATOMY OF A SKETCH

In Processing, programs are called 'sketches' and are stored in a folder called 'Processing' in your Documents library. Unless they're specific to an object or an object's method, Processing likes you to declare variables globally. When a sketch first runs, the function `setup()` is called and gives the programmer somewhere to put any initialisation code. After `setup()`, Processing repeatedly calls the `draw()` function, which effectively makes it loop indefinitely. If your sketch has some setup operations to perform, you'd write `setup()` yourself and any statements that must be run repeatedly would go in `draw()`. You don't have to use these two functions to structure a sketch, though. Your sketch can be a list of statements that run just once, but sketches that are more complex rely on `setup()` and `draw()`.

WORK WITH MINIM

The Minim library is shipped with Processing and is ready for use, so let's write a sketch to play a sound file. To do so, we need to define a couple of objects. The first is an instance of the Minim subsystem itself. The second is an audio player object that will load and play the file. We can then call the audio player's play method to play back the file.

```
import ddf.minim.*;

Minim minim;
AudioPlayer player;

minim = new Minim(this);
player = minim.
loadFile("Gnossienne 1 Lent.wav");
player.play();
```

Save the sketch by clicking 'File > Save as'. Enter a name and Processing will create a folder within the 'Processing' folder to store everything. Substitute your own file by copying it into the sketch's folder. Run the sketch again and you should hear your file being played.

ADVANCED FEATURES

Let's make things more interesting by making an oscilloscope. Here we'll use the `setup()` and `draw()` functions.

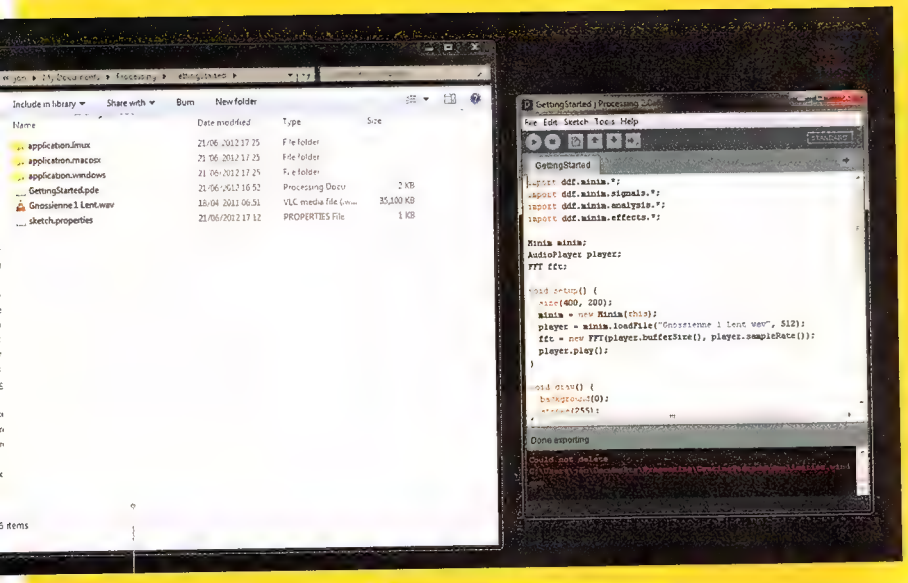
```
import ddf.minim.*;

Minim minim;
AudioPlayer player;

void setup() {
 size(400, 200);
 minim = new Minim(this);
 player = minim.loadFile
("Gnossienne 1 Lent.wav", 512);
 player.play();
}

void draw() {
 background(0);
 stroke(255);
 display_scope();
}

void display_scope() {
 for (int i = 0; i < player.bufferSize() - 1; i++) {
 float x1 = map(i,0,player.
bufferSize(),0,width);
 float x2 = map(i+1,0,player.
bufferSize(),0,width);
line(x1,50+player.left.get(i)*50,x2,50+player.left.
get(i+1)*50);
 line(x1,150+player.right.
get(i)*50,x2,150+player.right
get(i+1)*50);
 }
}
```

This time, we created a `setup()` function and inside this, when we loaded the file, we specified a buffer size of 512 bytes. This is where our oscilloscope function will read its data. We also specified a size for Processing's output window.

The `draw()` function repeatedly clears the screen by setting the background to black (colour zero) and the pen colour to 255 (white). It then calls `display_scope()`, which quickly walks across the current content of the audio player's input buffer and draws two oscilloscope traces depicting the current content. Run the sketch and you should see a dual-trace oscilloscope.

FREQUENCY ANALYSIS

Let's have even more fun by adding a visual signal analyser. To begin, create another object, this time of type 'FFT'. This stands for fast Fourier transform and is a method of quickly analysing a buffer for constituent frequencies. Add the following line of code to the sketch under the `AudioPlayer` definition:



Export your sketch and package it up in a .ZIP file to send to a friend.

EXPORTING

You can export a sketch from Processing as an executable that you can send to friend. To do so, click 'File > Export'. A window will pop up, giving you several target operating systems. Make sure you select the right one.

You can also select whether you want the application to run in full-screen mode. If your output window is quite small, this makes little sense, but if your sketch uses the whole screen, it's a good option. If you select this, the application will be compiled with a special 'Stop' button at the bottom-left so that users can return to the operating system.

Click 'Export' and the sketch folder will open. You should see a folder called 'application.<OS>', where OS is the name of the target operating system. If you have any resource files like music, paste them into each of these target folders. You can then email the application folders to people.

To run it, the user simply needs to drag the top-level folder in the .ZIP file to a convenient place, open it and double-click the executable.

```
FFT fft;
```

Now add the following line to `setup()` just before the line that begins playing the file:

```
fft = new FFT(player.bufferSize(), player.sampleRate());
```

Finally, we need to create the following function:

```
void display_spectrum() {
  fft.forward(player.mix);
  for (int i = 0; i < fft.specSize(); i++)
  {
    line(i*5, height, i*5, height - fft.getBand(i)*10);
  }
}
```

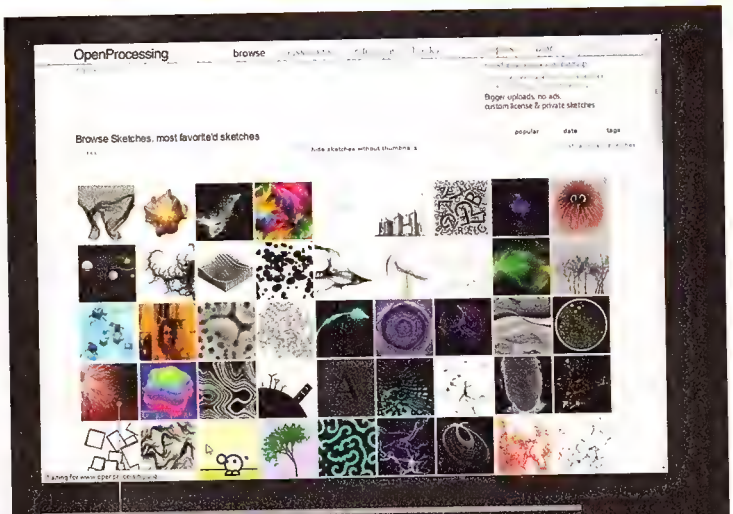
If you then add a call in `draw()` to `display_spectrum()` after displaying the oscilloscope traces, you should get a superimposed real-time analysis of the incoming sound. We can colour the lines in the spectrum analyser using the `stroke()` statement to reflect the intensity of sound at each analysed frequency:

```
stroke(0,fft.getBand(i)*10,0);
```

We can make the spectrum analyser display thicker bars using the `rect()` statement in place of `line()`. This draws a rectangle. We simply use the `fill()` statement to set the colour (in this case, the same dynamic green as before) and draw the rectangle.

```
fill(0,fft.getBand(i)*10,0);
rect(i*5,height,5,-fft.getBand(i)*10);
```

Processing is a powerful way to get visual ideas into code quickly, but its real power lies in the libraries that extend the core language. There are plenty of others besides Minim that ship with Processing 2.0, and more are maintained by the user community. There's a full list at **processing.org/reference/libraries**.



The OpenProcessing web site is packed full of free sketches.

ACCESS OPENPROCESSING

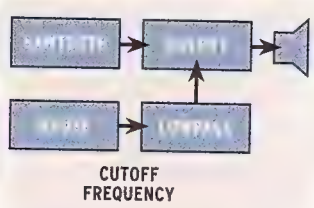
The OpenProcessing web site (**www.openprocessing.org**) contains hundreds of examples of Processing code sketches. Click 'Browse' at the top of the main page to open the archive of uploaded sketches. Click the 'Popular' tab to see sketches other people like or select 'Tags' to search by subject. Each Sketch at OpenProcessing also runs in your web browser, so exploring is easy.

There are so many sketches on offer, it's useful to click 'Collections' and see the groups that others have pulled together.

To see the source code for a sketch, click the 'Code' tab. You can then copy and paste it into Processing. Many of the sketches on the web site feature extensive and very descriptive comments, which will help you understand what's going on behind the scenes. If you're feeling particularly proud of your own work, you can upload own sketch to OpenProcessing and show off your skills. Finally, if you create an account, you can set up your own portfolio to show off your sketches.

LOW-PASS FILTERING

Take more control of Minim's audio output.



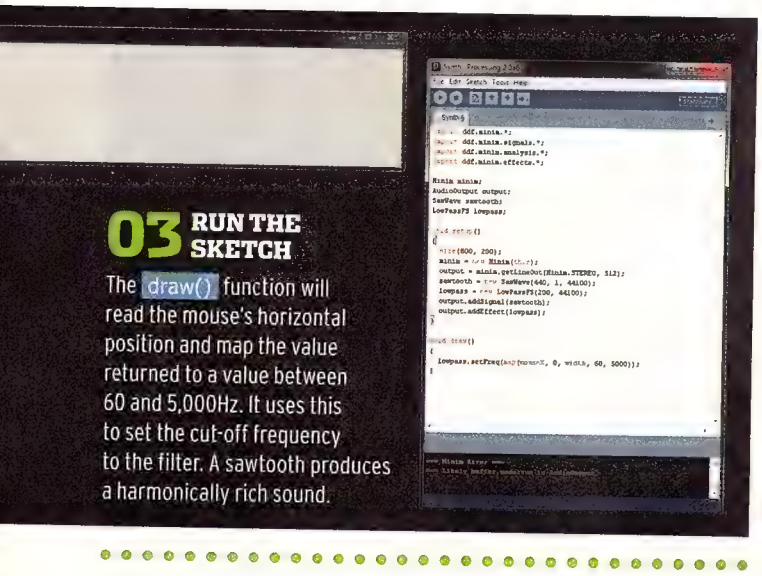
01 VISUALISING THE FILTER

We'll create an oscillator that produces a sawtooth waveform, an audio output to play the sound the oscillator makes, and a low-pass filter, which will act on the audio output to filter the sound.

02 THE CODE

Enter the following sketch and run it.

```
import ddf.minim.*;
import ddf.minim.signals.*;
import ddf.minim.analysis.*;
import ddf.minim.effects.*;

Minim minim;
AudioOutput output;
SawWave sawtooth;
LowPassFS lowpass;

void setup()
{
  size(800, 200);
  minim = new Minim(this);
  output = minim.getLineOut(Minim.STEREO, 512);
  sawtooth = new SawWave(440, 1, 44100);
  lowpass = new LowPassFS(200, 44100);
  output.addSignal(sawtooth);
  output.addEffect(lowpass);
}

void draw()
{
  lowpass.setFreq(map(mouseX, 0, width, 60, 5000));
}
```

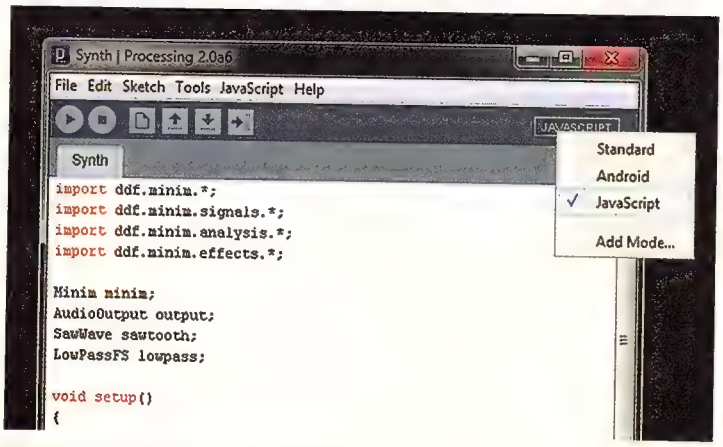


03 RUN THE SKETCH

The `draw()` function will read the mouse's horizontal position and map the value returned to a value between 60 and 5,000Hz. It uses this to set the cut-off frequency to the filter. A sawtooth produces a harmonically rich sound.

GENERATE JAVASCRIPT

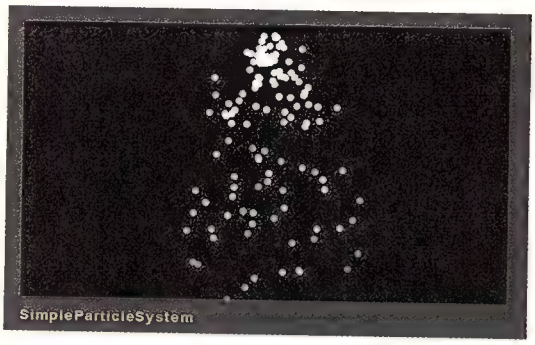
Make your web page shine with a few clicks.



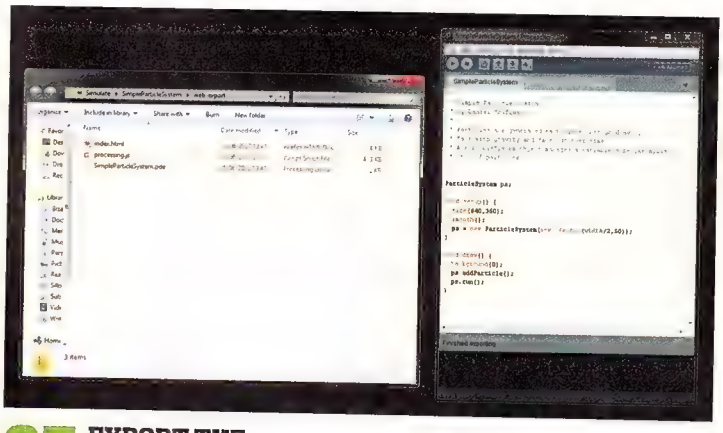
01 SWITCH TO JAVASCRIPT MODE

To make a web page from a sketch, we can convert it to JavaScript so any web browser can read it without having Java installed. Save the sketch and then click 'Standard' at the top-right of the Processing programming environment. Select 'JavaScript' from the list of alternatives and the environment will relaunch itself in JavaScript mode.

02 RUN THE SKETCH



To run the sketch, simply click the 'Run' button on the toolbar. Processing will start a web server in the background and open your default web browser (or a new tab if it's already running) to run the sketch. If your browser has a plug-in such as NoScript running, you'll have to enable scripts on your local host (127.0.0.1) to allow the sketch to run.



03 EXPORT THE SKETCH

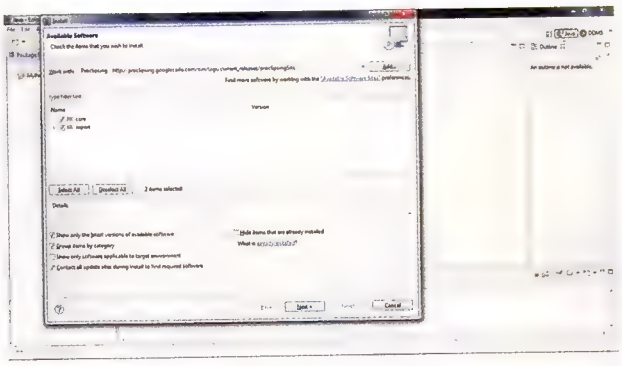
Click 'File > Export' and the sketch will be exported as a JavaScript app. The folder containing the app will open. It contains three files and a folder, the first of which is 'index.html'. Double-click this to run the app. The second file is the main Processing JavaScript library, 'processing.js'. Finally, there's the sketch itself. Any necessary libraries are within the 'Libs' folder.

PROCESSING IN ECLIPSE

If you use Eclipse to develop Java, you can develop sketches with the Proclipsing plug-in.

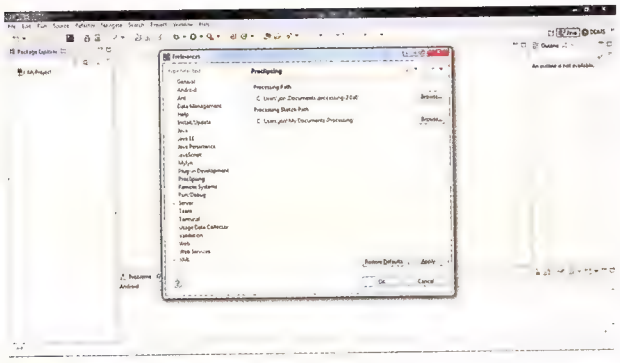
01 GET ECLIPSE

With Java installed, download Eclipse IDE for Java Developers from **www.eclipse.org/downloads** and open the .ZIP file. Drag the top-level folder from this archive to your Documents library, open the folder and double-click the executable. The Eclipse environment should open and ask you for a workspace. Accept the default.



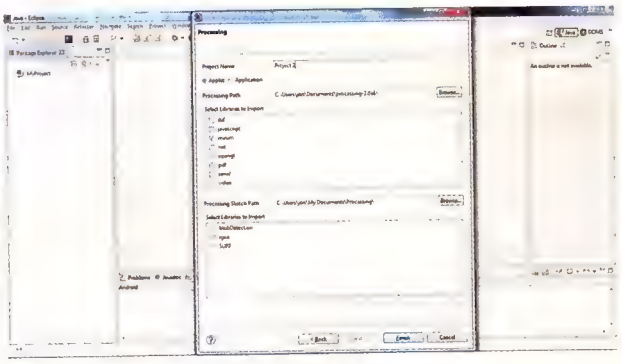
02 INSTALL PROCLIPSING

Click 'Help > Install new software > Add'. Enter the name Proclipsing and a location of http://proclipsing.googlecode.com/svn/tags/current_releases/proclipsingSite/ . Click 'Add' and tick the 'Core' and 'Export' boxes. Click 'Next' twice, accept the licence agreement and click 'Finish'. You"ll be asked to restart.



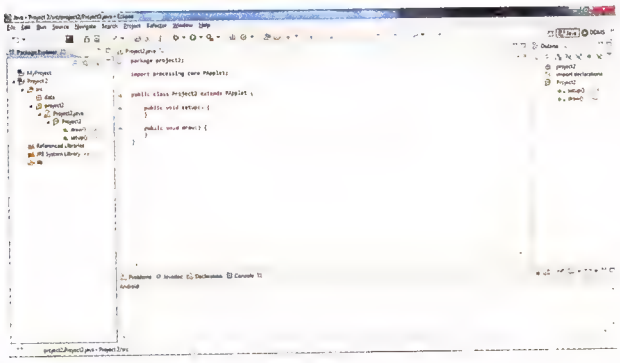
03 CHECK THE INSTALLATION

You now need to make sure Proclipsing installed correctly. To do so, click 'Window > Preferences'. In the resulting window, you'll see an entry in the left-hand pane called 'Proclipsing'. Click this and make sure the two paths in the right-hand pane are set to the folder containing the Processing executable and the Processing sketchpad.



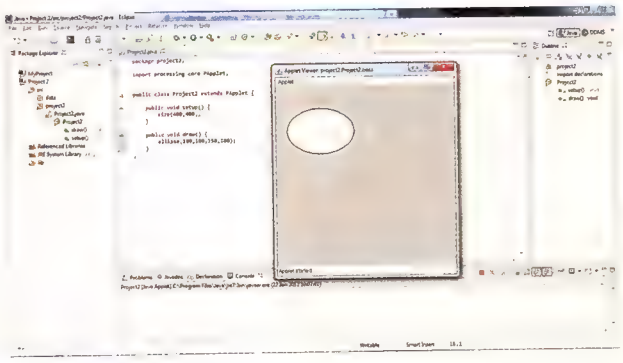
04 CREATE A PROCESSING PROJECT

You can now create a Processing project to see what it looks like. To do so, click 'File > New > Project'. In the window that appears, scroll down to the 'Processing' entry, click to expand it and select 'Processing project'. Click 'Next', enter a project name and select the libraries you want to use. Click 'Finish' to create the project.



05 PROJECT STRUCTURE

Your project's tree will appear in the left-hand pane. Expand it and the 'src' sub-tree. In here is a data folder to store your media files, images and so on. You'll also find the sketch. Expand this and double-click the Java file to open it. A Java source file will appear. Notice that it contains the usual `setup()` and `draw()` functions.



06 RUN THE SKETCH

To give the sketch something to do, add the line `size(400,400)` to the `setup()` function. Add the line `Ellipse(100,100,150,100)` to the `draw()` function. Save the project and run it by clicking 'Run > Run as > Java applet'. The output window will appear containing an ellipse. You're now running a sketch in Eclipse! apc

8/10

TRITTON DETONATOR STEREO HEADSET

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@ www.trittonaudio.com
$ $130

Finding a jack-of-all-trades headset that sounds great across all disciplines – especially the Xbox, where licensing can be an absolute pain for third parties – for reasonable money can be a tall order, but Tritton's latest range of officially licensed Xbox 360 gear just might fit the bill. The Detonator is the middle child in the multi-disciplined range and for our money, carries the best bang-for-buck features. It's a plug-and-play setup for the PC and mobiles, but be warned that there are a few necessary (included) cables to string together to get comms up and running on the 360. The headset is rugged enough to handle the rigours of travel, yet light and luxurious enough to be instantly comfortable for long-term use. The guts of the Detonator house a set of monster 50mm drivers, which tend to favour the lower end of the histogram, but not so much that the mids and brights are underrepresented. There's also a detachable boom mic on the left can, which when coupled with the Selective Voice Monitoring feature means everyone – including yourself – can hear your incredibly funny and relevant quips over Xbox Live Chat. Remember, it's detachable.

Troy Coleman

Borderlands 2

Space cowboy for hire.

PC

@ www.borderlands2.com
$ PC $69.95, consoles $89.95

We may have been a little harsh on the first *Borderlands* game. We reviewed it on the Xbox 360 and while it was fun enough, no amount of stylish art can hide an awful interface, sloppy controls, unwieldy inventory, bad AI and repetitive gaming. Having just had another run through on the PC to prepare for the sequel, it's funny what a few years, a couple of hundred 'in between' games (good, bad and atrocious) and a platform change can do for one's perspective. *Borderlands* felt so much better on the PC. And now with *Borderlands 2*, Gearbox has doubled its size, retuned and built upon the fundamental problems of the original, and delivered one hell of a game.

The story takes place five years after the first and Pandora is under the iron-fisted rule of the Handsome Jack, leader of the Hyperion Corporation, who aims to control the lucrative mineral Eridium mineral industry. A quest-based FPS with moderate RPG elements, players once again take on the role of a Vault Hunter, galactic adventurer, based on the planet Pandora, where rumours have surfaced of another vault said to contain caches of alien tech. There are four new classes to choose from and while it's a bit of a shakeup from what we played in the first, they all still focus on shooters. However, they have complementing skills themed around the classic assassin, commando, magic and muscle classes familiar to the genre.

Stripping them bare, the quests don't vary much from the standard fare of kill, fetch and escort, but they're overladen with such wonderfully written and genuinely thigh-slappingly funny dialogue that the only grind in *Borderlands 2* is the neverending loot grind. The game never takes itself too seriously and that's part of the appeal. Players willing to take their time, get off the beaten track and chug through all the content will even be rewarded by the bucketloads of pop culture references subtly woven into the gorgeous visuals and dialogue. The hidden Minecraft room, double rainbows and the nod to *The good, the bad and the ugly* were definitely our favourites.

Multiplayer once again comes in the form of drop-in/out co-op for up to four players, which not only yields better loot from tougher enemies, it's also great fun. While it's still a little too early to start waving around the GOTY banner, especially with the like of *Dishonoured* landing soon, but *Borderlands 2* is a real contender.

Troy Coleman

✔ Fixes most of the problems of the first to set itself as a must-play FPS RPG.
✖ Still some minor interface annoyances.

10/10

Guild Wars 2

Grind, grind, ding! Craft, run, grind, ding!

PC

@ www.guildwars2.com $ $89.95

8/10

Finding your way around a fantasy MMORPG world should be pretty familiar by now – players choose a race then narrow it down to one of the classic class mix of magic-using casters and stabby-thing-wielding melee. They then make their way through the world – in this case, the massive world of Tyria – killing stuff and performing menial quests for incremental gain, loot and the satisfying ding of levelling up. Like almost every MMO on the market, *Guild Wars 2* is primarily quest-based, but rather than the norm, it's tied fairly closely around exploration, with each new location a new quest hub. Being constantly on the move gives a tremendous sense of progression, but sadly the quest mix is as plain and uninspired as every other MMO out there, revolving around the usual kill, fetch and escort quest, the only break being some dynamic world events. After a while, even they become a grind.

Guild Wars 2 places far less emphasis on a specific class make-up for solo or grouped success, with most having enough tricks to be self-reliant. The combat is also a little different, with skills and combinations tied to weapon mixes and earned through repeated use; for example, switch from a two-handed staff to a dagger and focus changes the skill set from single long-range target to short-range AOE. It's a subtle mix-up that improves the flow and alleviates some of the dreaded grind toward the level cap of 80. It can be arduous and several times we outlevelled the content for the area, but were way too squishy to tackle the next, instead having to mindlessly pound respawns to catch up. Once you get there, the real fun – and what should prove its longevity – starts in the form of PvP.

While there are distinct similarities to every other MMO on the market, *Guild Wars 2* is a viable alternative that manages to revitalise the genre. It's chalked itself in as the new benchmark for others to build upon, and all without the need for a subscription model.

Troy Coleman

- ✔ A one-off purchase MMO that attempts to shake up the standard conventions of the genre.
- ✖ No subscription required, the grind tends to become very boring very fast.

8/10

RUN ROO RUN

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✖ Frustrating.

iOS

On the surface, this looks like a simplistic single-screen platform puzzler: a game for the kids with no real essence or exceptional challenge. And you'd be right. Partly. The idea *is* simple and great for kids. Get Roo to the end of each level while navigating platforms and avoiding pitfalls. There's a ton of content, too – 420 levels in the initial download and a new pack of six free levels every week. There's a sinister side just below the surface for adult gamers, when you start to challenge yourself to finish the levels in 'gold medal time'. It becomes an exercise in pure frustration while you restart levels in an effort to perfectly time your jump, swing and slide on what seems like a pixel level, but there's something so great when it all comes together. That warm glow and masochistic satisfaction that comes from being an obsessive-compulsive completionist can't be beaten – just don't tell your friends 'cause they'll tease you for playing kids' games.

Troy Coleman

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PREVIEW

HITMAN: ABSOLUTION

Next to mine, Agent 47 has the second sexiest bald head I know.

RELEASE DATE NOVEMBER 2012

PC • PS3 • 360

We were lucky enough to sit down and get an early taste of the upcoming fifth instalment to IO Interactive's fantastic stealth action franchise and were really impressed with what's on offer. The overall look and feel of the game is solid, running on the new Glacier 2 engine, which is powerful enough to allow devs to work in real time with an onscreen cast of up to 1,000 AI-controlled characters, all reacting and adapting to how the player approaches the level. We sampled some of the early campaign as well as the multiplayer element called Contracts. While there's no multiplayer in the traditional sense, IO picked up on the idea that literally anyone could be a target and injected that into the game's main campaign scenarios. The idea is actually quite cool; play through key scenes of the campaign, choose a target and assassinate them, and then upload the 'contract' as a points-based skill challenge for others to try and beat. Fun for the whole family.

Troy Coleman

Dark Souls: Prepare To Die Edition

Deadly and deceptive — and that's the way it likes it!

PC

@ www.preparetodie.com $ $69.95

Dark Souls isn't a happy game and there are moments when playing it that you'll feel distinctly glum as well. Not because it's not well crafted, but simply because it's a game with a dark, foreboding atmosphere and a difficulty curve that can best be described as utterly vertical. You'll die over and over again; never entirely unfairly, but because it's a game that's incredibly precise, it's also incredibly unforgiving.

You start out as a lost soul with almost nothing and pretty much everything around you wants to take even that away from you. This is a dark fantasy game of delicate exploration, nerve-wracking combat, and lots and lots of death. You'll want to avoid dying, as it actively costs you experience and humanity that you strive to recover, but you'll die quite a lot anyway. *Dark Souls* is a console port and it shows; by default, it's locked to 720p – but a hack can unlock that – and it doesn't control that well with a mouse and keyboard. A gamepad is a much better idea.

If you like really stiff challenges, *Dark Souls* has a lot of content to drop yourself into. Just don't blame us if you end up a little depressed by the whole thing.

Alex Kidman

✔ Moody, atmospheric and challenging.
✖ Steep learning curve, a tad on the depressing side.

8/10

Sleeping Dogs

There were funky China men from funky Chinatown.

PC

@ www.sleepingdogs.net $ PC $69.95, consoles $89.95

A third-person, over-the-shoulder action game in the same vein as Hong Kong action films, players take on the role of Wei Shen, a Chinese-American cop who goes undercover to infiltrate the Sun On Yee Triad organisation. The story, while a little over the top and strewn with as many action film references as you can think of (gunplay, kung fu fighting, angry tattooed gang members and our favourite, overweight cleaver-wielding singlet-wearing cooks) is well-written and paced, and cuts through to the core of Wei's struggle.

The main story isn't too lengthy, but there's more than enough content in the side mission, random encounters, car races and exploration to fill the space. It's an approachable game with a fairly shallow learning curve and anyone vaguely familiar with the GTA series – what we consider the yardstick for open-world action gaming – will be able to find their way around, as the core driving, navigation, mission and conversational mechanics are mostly the same.

But that's fine with us because the level of original flavour, style and story complexity Square Enix has tweaked and woven into that 'template' is incredible. *Sleeping Dogs* is a pleasantly violent surprise.

Troy Coleman

✔ Raising the benchmark for open-world action games.
✖ Shortish main campaign.

9/10

123 chipchat

SIMON CHESTER

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RESEARCHERS CREATE HYBRID ROBOT/ COCKROACH

Some may freak out a little when they see the little brown bug skittering across their kitchen floor, but researchers at North Carolina State University in the US saw only opportunity, having recently strapped a microcontroller to the back of a Madagascar hissing cockroach in order to control its movements.

While images of brain implants immediately come to mind, the scientists used a simpler method: electrically stimulating the antennas and abdomen to fool the cockroach into thinking it's in danger.

By doing so, the researchers were able to precisely steer the roach along a curved line. The idea is that different sensors could be included on the microcontroller, enabling data to be collected from otherwise inaccessible environments. Just one more step toward the robot apocalypse, I know.

HUNGRY HUNGRY KOOPAS

Hungry Hungry Hippos was a fun game as a kid, but it was never as fun as *Mario 3* on the NES. Noting this problem, Kodykoala (not his real name) has created *Hungry Hungry Koopas*, which replaces those boring, old hippos with the Koopa Kids. These painstakingly detailed reworks of the old game each took about 50 hours to make – Mr Koala even took the time to add individual brick textures to the platform and clear-coated the game five times so your children's greasy hands wont tarnish the paintwork (please don't let your children play it).

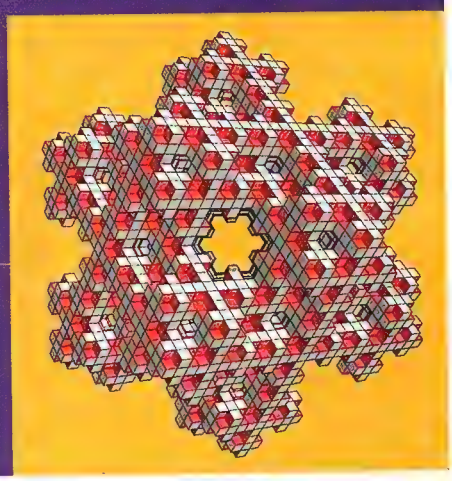
You can check out more images of the project, including some up-close detail at Kidkoala's Flickr page at **tinyurl.com/816nh7j**. apc

BUILDING FRACTALS

Lamenting this fact (and not wanting to be outdone by their northern, cockroach-controlling compatriots), 300 students and volunteers from the University of Southern Carolina built the world's first physical representation of the Mosely Snowflake Fractal out of almost 50,000 business cards.

The Mosely Snowflake Fractal was discovered in 2006 by engineer (and origami practitioner) Jeannine Mosely, who also constructed the Menger sponge fractal that same year, requiring a whopping 66,000 business cards. The Menger sponge was the first 3D fractal to be discovered by Karl Menger in 1926. The construction method for the snowflake was devised by Mosely herself, requiring a computer model to assess the number of business cards required. The cards were assembled into thousands of cubes, which were then joined together to create larger modules, which would then join together for the final piece. As complicated as it is impressive.

Videos of Mosely explaining the different parts of the construction are available at **vimeo.com/user10658710**.



IRL representation of Mosely Snowflake Fractal, made from business cards. If you don't think fractals are cool, then I don't think you're cool. Unfortunately, as cool as fractals are, they don't really exist in any impressive form outside of a PC.

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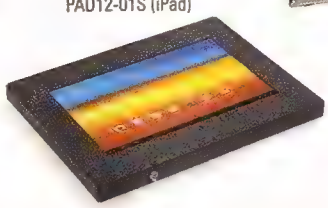

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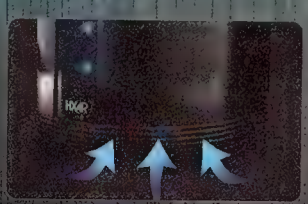

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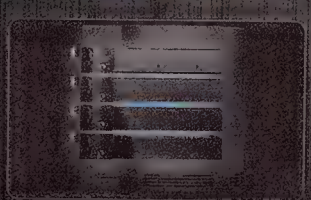

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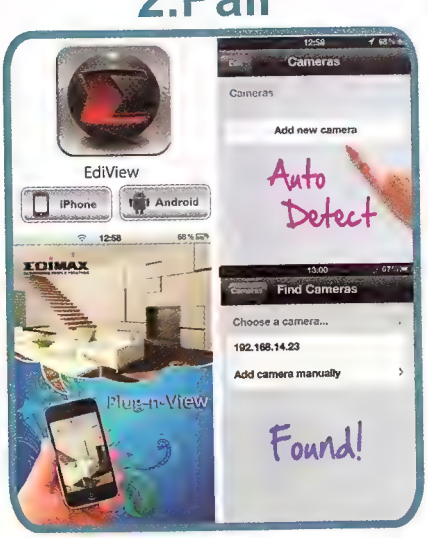

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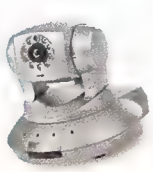

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HIS 7770 IceQ X is 13°C cooler than reference cooler.

<28 dB

The card is below 28 dB when watching movies, surfing Facebook, checking emails. The card remains quiet whether you are gaming, online socializing, entertaining or working.

2x 6mm wide copper heatpipes optimize cooling performance by removing heat from the core area.

The super large 9.2cm axial fan draws massive amount of cool air to cool the GPU directly.

Dynamic Phase Control PWM IC

The advanced energy saving technique not only makes HIS cards environmentally friendly but also saves money on your electricity bills!

Full Solid State Capacitors

These capacitors of the hightest quality and durability extends the lifespan of the card. You can count on HIS cards to game hard 24/7/365 days of the year!

Solid State Choke

Using only the finest material, HIS cards offer outstanding stability and power capacity - making the best out of power and unleashing clock speeds to the limit!

HIS-Proud winner of over 1450 awards from major media worldwide

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